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# *A Study of Overhead Rate Behavior at a U.S. Air Force Base in the Context of A-76 Competitions*

*Alan J. Laverson*

***RAND Graduate School***

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# List of Acronyms

ABC – Activity-Based Costing
AFB – Air Force Base
AFCAA – Air Force Cost Analysis Agency
AFCQMI - Air Force Center for Quality and Management Innovation
AFI – Air Force Instruction
AFMEA - Air Force Management Engineering Agency
AFMS – Air Force Manpower Standard
AFPD – Air Force Policy Directive
AFTOC – Air Force Total Ownership Cost
AGOR – Actual Government Overhead Rate
AMW – Air Mobility Wing
BOS - Base Operating Support
BST – Base Support Tail
CA – Commercial Activity
CMDB - Consolidated Manpower Database
CME - Contract Man-year Equivalent
CPO – Civilian Personnel Office
DC – Direct Cost
DL – Decision Line
DLC – Direct Labor Cost
DNLC – Direct Non-Labor Costs
DoD – Department of Defense
DRI – Defense Reform Initiative
DRID – Defense Reform Initiative Directive
DSB – Defense Science Board
FAC - Functional Account Code
FY – Fiscal Year
GAO – General Accounting Office
HQ - Headquarters
MAF – Man-hour Availability Factor
MAJCOM – Major Command
MEO – Most Efficient Organization
O & S – Operating and Support
OHC – Overhead Cost
OHR – Overhead Rate
OMB – Office of Management and Budget
OSD – Office of the Secretary of Defense
PEC – Program Element Code
TCL – Total Cost Line
UMD – Unit Manning Document
UPMR - Unit Personnel Management Roster
USAF – U.S. Air Force

# Chapter 1 Background

## 1.1 Policy Environment for Outsourcing Commercial Activities

If the Air Force decides that a specific function is required, it can acquire it three different ways. It can: (1) perform the function itself (i.e., in-house), (2) contract out (i.e., outsource)[1] to another government organization (e.g., General Services Administration) in what is called an Interservice Support Agreement (ISSA), or (3) outsource to a private organization. When choosing the source that should perform a particular function, there are a number of issues that should be considered, including cost, quality, legislation, and the policy environment. In accordance with current Department of Defense (DoD) policy, the Air Force is increasingly looking toward the private sector to achieve cost-effective performance of what the Office of Management and Budget (OMB) calls commercial activities. A commercial activity (CA) is one which is operated by a Federal executive agency and which provides a product or service that could be obtained from a commercial source.[2]

It is the policy of the United States Government to: (1) achieve economy and enhance productivity through the use of competition, (2) retain governmental functions[3] in-house, and (3)

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[1] Outsourcing is the contracting of a new requirement or the transfer of an existing activity that has been performed in-house to an outside provider. The Air Force retains full control and responsibility (through service contracts) of the recurring services or functions which are outsourced. Privatization is a subset of outsourcing which involves the transfer or sale of government assets (e.g., plant and equipment) to the private sector. (AFPD 38-6, p. 8)

[2] Office of Management and Budget, *Circular no. A-76, (Revised 1999)* (OMB 1983), paragraph 6a.

[3] Office of Federal Procurement Policy (OFPP) Policy Letter 92-1 (OMB 1992), "Inherently Governmental Functions," defines an inherently governmental function as follows:

"Definition. As a matter of policy, an 'inherently governmental function' is a function that is so intimately related to the public interest as to mandate performance by Government employees. These functions include those activities that require either the exercise of discretion in applying Government authority or the making of value judgments in making decisions for the Government. Governmental functions normally fall into two categories: (1) the act of governing, i.e., the discretionary exercise of Government authority, and (2) monetary transactions and entitlements.

An inherently governmental function involves, among other things, the interpretation and execution of the laws of the United States so as to:

(a) bind the United States to take or not to take some action by contract, policy, regulation, authorization, order, or otherwise;

rely on the commercial sector to provide a commercial product or service if it can be procured more economically.[4] This national policy was promulgated through Bureau of the Budget Bulletins issued in 1955, 1957 and 1960. OMB Circular No. A-76, which establishes Federal policy regarding the performance of commercial activities, was originally issued in 1966. It was revised in 1967, 1979, 1983, and again in 1999. The Circular A-76 Supplemental Handbook, which describes procedures for determining whether commercial activities should be performed under contract with commercial sources or in-house using Government facilities and personnel, was initially issued in 1979. It was updated in 1983 and again in March 1996.

As stated in Circular A-76, the principle behind the current policy is that "In the process of governing, the Government should not compete with its citizens. The competitive enterprise system, characterized by individual freedom and initiative, is the primary source of national economic strength."[5]

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(b) determine, protect, and advance its economic, political, territorial, property, or other interests by military or diplomatic action, civil or criminal judicial proceedings, contract management, or otherwise;

(c) significantly affect the life, liberty, or property of private persons;

(d) commission, appoint, direct, or control officers of employees of the United States; or

(e) exert ultimate control over the acquisition, use, or disposition of the property, real or personal, tangible or intangible, of the United States, including the collection, control, or disbursement of appropriated and other Federal funds.

Inherently governmental functions do not normally include gathering information for or providing advice, opinions, recommendations, or ideas to Government officials. They also do not include functions that are primarily ministerial and internal in nature, such as building security; mail operations; operation of cafeterias; housekeeping; facilities operations and maintenance, warehouse operations, motor vehicle fleet management and operations, or other routine electrical or mechanical services."

OMB's Circular A-76 (Revised 1999) provides examples of (1) The act of governing; i.e., the discretionary exercise of Government authority (e.g., criminal investigations, prosecutions and other judicial functions; management of Government programs requiring value judgments, as in direction of the national defense; management and direction of the Armed Services; activities performed exclusively by military personnel who are subject to deployment in a combat, combat support or combat service support role; conduct of foreign relations; direction of Federal employees; regulation of the use of space, oceans, navigable rivers and other natural resources; direction of intelligence and counter-intelligence operations; and regulation of industry and commerce, including food and drugs), and (2) Monetary transactions and entitlements (e.g., tax collection and revenue disbursements; control of the treasury accounts and money supply; and the administration of public trusts).

[4] Office of Management and Budget, *Circular no. A-76, (Revised 1999)* (OMB 1983), paragraph 5.

[5] Office of Management and Budget, *Circular no. A-76, (Revised 1999)* (OMB 1983), paragraph 4a.

The Services implemented this policy, to varying degrees, from 1979 until 1992. Following a 17-month legislative moratorium on outsourcing in accordance with Circular A-76 procedures,[6] DoD studies have consistently recommended an aggressive outsourcing policy. The Commission on Roles and Missions of the Armed Forces (CORM) recommended that DoD should "return to the basic principle that the government should not compete with its citizens," and should aggressively pursue outsourcing essentially all commercial activities, and that all new needs should be channeled to the private sector from the beginning.[7] In March of 1996 the Office of the Secretary of Defense (OSD) released a report, *Improving the Combat Edge Through Outsourcing* (DoD 1996b), that described and promoted DoD-wide efforts to improve overall performance and lower costs through outsourcing. In August 1996, the Defense Science Board's (DSB) Task Force on Outsourcing and Privatization (DSB 1996a) recommended that the Secretary of Defense should reiterate in a formal policy statement that the private sector is the preferred provider of support services to DoD and that leadership is committed to implementing an aggressive outsourcing program because outsourcing is critical to the long-term combat effectiveness of U.S. military forces. It further recommended that the Secretary stress that all non-combat support services must be considered for outsourcing, except those that are inherently governmental, and stated that "combat" support functions should be defined only as those front-line battlefield support services that are likely to expose support personnel to direct enemy fire, and that the concept of inherently governmental should be interpreted narrowly.

In November 1997, the Secretary of Defense issued the Defense Reform Initiative (DRI) Report (DoD 1997a) to improve business practices in the Department. One of the methods proposed was the use of public-private competitions.[8] This was followed by the release of over 40 Defense Reform Initiative Directives (DRID). Department of Defense Reform Initiative Directive (DRID) #20, *Review of Inherently Governmental Functions* (DoD 1998a), directed the

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[6] The National Defense Authorization Acts for FY93 and FY94 contained a clause prohibiting the Secretary of Defense from entering into any contract for the performance of a commercial activity in any case in which the contract results from a cost comparison study conducted by the Department of Defense under Office of Management and Budget Circular A-76 or any successor administrative regulation or policy. The legislative moratorium lasted from October 23, 1992 through April 1, 1994.

[7] Report of the Commission on Roles and Missions of the Armed Forces, *Directions for Defense* (CORM 1995), p. 3-3.

[8] The DRI Report has four chapters. Chapter 3 is titled "Streamlining Through Competition."

DoD Components to inventory their manpower positions to determine which are: (1) inherently governmental in nature, (2) commercial activities exempt from OMB Circular A-76 competition,[9] and (3) commercial activities that should be competed. It further directed a review of all functions to determine those that must be performed by government employees and those that should be subject to competition under OMB Circular A-76 procedures. Results of that review were that approximately 62,000 positions, or 9 percent of the total Air Force workforce (i.e., military and civilian), are eligible for outsourcing.[10]

DRID #9 (DoD 1997b) directed the Military Departments to develop a plan for privatizing all of their utility systems (electric, water, waste water and natural gas) by January 1, 2000, except those needed for unique security reasons or when privatization is uneconomical. Due to the large number of utility systems to be considered and the complexity of issues surrounding these transactions, DRID #49 (DoD 1998b) directed them to revise their plans to accommodate award of privatization contracts for all utility systems (except those exempted in accordance with supplied guidance) no later than September 30, 2003.

Air Force Policy Directive (AFPD) 38-6, *Outsourcing and Privatization* (Dept of AF 1997b), also issued in 1997, directed the major commands (MAJCOMs) and HQ USAF Functionals to review 100 percent of Air Force activities by the year 2003 to determine whether activities should be retained in-house (i.e., unchanged or reengineered), competed for outsourcing, outsourced directly, privatized, or transferred to the Air National Guard or Air Force Reserve.

Massive outsourcing will fundamentally change the nature of the Air Force and the concept of an Air Force base. This research is intended to provide some insight into the overhead savings that can be expected as the Air Force implements the DoD policy of outsourcing as many commercial activities as is economically feasible.

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[9] The Air Force is prohibited by regulation from outsourcing some functions that can be obtained from a commercial source (e.g., base security, fire protection). Other commercial activities are not outsourced as a matter of Air Force policy (e.g., child care).

[10] Results reported to the Air Force Board, Air Force Group, Secretary of the Air Force, and Chief of Staff in a briefing by AF/XPMR (the Requirements and Utilization Division of the Directorate of Manpower, Organization and Quality). The data source was the DRID20 database current as of October 1998.

## 1.2 Benefits and Risks of Outsourcing

### 1.2.1 Reasons to Outsource

There are a number of reasons an organization may choose to outsource functions. For the Air Force, the primary rewards from outsourcing a function are to: (1) reduce costs, (2) improve performance, (3) focus on its core mission competencies and service requirements, and (4) access innovations more quickly.[11]

When a firm specializes in producing a specific good or service, it may have core competencies and economies of scale in the field. Throughout DoD, competitions conducted between 1979 and 1994 resulted in an average reduction in annual operating costs of 31 percent, resulting in total savings of $1.5 billion a year.[12] Based on competitions from FY 1997 to FY 2005, DoD expects cumulative savings of approximately $11.2 billion.[13]

Another reason for the Air Force to outsource is the desire to improve performance. Using providers who specialize in producing a particular good or service can exploit their core competencies to improve quality, reliability, and responsiveness. The Defense Logistics Agency's (DLA) Direct Vendor Delivery and Prime Vendor programs allow DLA to deliver supplies to warfighters cheaper and faster. In the case of pharmaceuticals, DoD customers now receive their requested goods 75 to 90 percent faster (within 24 hours) and 25 to 35 percent cheaper.[14]

Outsourcing can also allow the Air Force to concentrate its management focus and resource investments in areas most directly related to accomplishing its core missions. With the Air Force performing fewer activities, leadership can focus their efforts on the core missions of the Air

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[11] Whereas accessing innovations more quickly can be viewed as reducing costs and/or improving performance (i.e., the first and second items in the list) in the long run, it was included separately to portray time as an important independent variable.

[12] *Defense Reform Initiative Report* (DoD 1997a), p. 29.

[13] *Defense Reform Update 1999* (DoD 1999).

[14] *Improving the Combat Edge Through Outsourcing* (DoD 1996b).

Force and, with intelligent outsourcing strategies, free up funds by having contractors assume responsibility for investments in fixed assets. Air Force efforts to privatize military housing and utilities are examples of this.

Outsourcing can also provide quicker access to innovations developed in the marketplace. For a firm to successfully compete in a rapidly changing technological environment, firms specializing in producing a specific good or service may be more informed than the Air Force about recent advances (i.e., technological and managerial) and have the managerial and financial flexibility to implement them.

These concepts are summarized in AFPD 38-6 (Dept of AF 1997b) by the four principle goals of outsourcing:

> *Sustain readiness.* A key goal of O&P is to ensure high levels of readiness and mission capability are sustained across the Air Force by the most efficient and cost-effective services available, whether they are performed in-house or by the private sector, even if they are inherently governmental or military essential.
>
> *Improve the performance, quality, efficiency, and cost-effectiveness of Air Force activities.* Strategic sourcing expands the network of available suppliers to increase the Air Force's access to services that are "best in class."
>
> *Generate savings for modernization* by pursuing cost-effective solutions to save the Air Force money and time while simultaneously ensuring adequate resources are allocated to maintain installations. The major "driver" for the overall O&P Program is the need to save substantial amounts of money by doing business more efficiently and cost effectively – regardless of whether activities are outsourced, privatized, or retained in-house.
>
> *Focus personnel and resources on core activities.* Strategic sourcing will facilitate increased Air Force management focus on core activities while capitalizing on other public and private sector expertise, investment, and capability. Core activities may vary by MAJCOM, and the determination of what constitutes "core" activities can change over time. (Dept of AF 1997b, 12)

This research pertains specifically to commercial activities for which cost reduction is at least one of the motivations to outsource and, in particular, addresses the problem of overhead cost estimation.

### 1.2.2 Reasons to Perform a CA In-House

There are a number of risks in outsourcing, any of which could induce the Air Force to perform a function in-house. From a mission perspective, they are: (1) catastrophic failure to perform, (2) loss of real-time control, (3) inadequate investment in specific assets, (4) loss of needed skills, and (5) difficulty specifying requirements.[15]

Catastrophic failure to perform includes the inability and unwillingness to provide the service during peacetime, as well as the inability and unwillingness to provide surge capability necessary during contingencies and to provide services in a combat theater.[16] Because DoD has emphasized cost as a primary concern in the past, some providers have gone out of business during the contract period. If this occurs DoD is either left without a viable provider or must provide additional funding to acquire another source. A major concern to commanders is the predictability of support during contingencies and in combat zones. For example, during the Gulf War one major defense contractor withdrew its personnel from the theater when the threat of a Scud missile attack arose and would not accept any amount of money offered to return them.[17] Another example is "owners of CRAF (Civil Reserve Air Fleet) aircraft, whom DoD had subsidized for years in exchange for making these aircraft available when called, lobbied to discourage DoD from asking for these assets during the Gulf War."[18] "Repeated tests have

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[15] There are other, ancillary concerns related to outsourcing (e.g., fraud, negative economic effects involved with transferring the performance of an activity from one community to another) that won't be discussed here because they are not directly related to mission performance.

[16] The combat theater includes more than frontline areas. The Defense Science Board's (DSB) Task Force on Outsourcing and Privatization (DSB 1996a) recommended that "combat" support functions should be defined only as those front-line battlefield support services that are likely to expose support personnel to direct enemy fire, and that the concept of inherently governmental should be interpreted narrowly.

[17] *Expanding Private Production of Defense Services* (Camm 1996, p. 21).

[18] Ibid., p. 19.

shown that otherwise apparently rational decisionmakers systematically underestimate the likelihood and cost of major, unusual events, such as a mobilization that would call upon contractor surge capability."[19]

Another risk, related to the predictability of support during contingencies, is the loss of real-time control. Due to the unpredictable nature and fast pace of war, often requiring 24-hour-a-day operations, short decision cycles, and a high degree of coordination between activities, even short delays in execution of orders can be problematic. Contractual boundaries can cause misunderstandings and delays or disconnects in effective information flow. Real-time control is most important for functions that directly support combat and combatant organizations, and becomes less critical the more removed the function is from combat.

Outsourcing can also result in inadequate investment in specific assets.[20] DoD possesses a number of unique systems. Transaction Cost Economic[21] theory predicts that for a contractor to invest in assets that have no use other than the maintenance or improvement of one of these unique systems, it must be convinced that the payoff will exceed the investment. In short-term contracts with the possibility of losing the next competition, contractors are reluctant to invest in these systems. Even in very long-term contracts, Lyons (1994) found that most firms would inadequately invest in specific assets.[22]

Outsourcing may also lead to a situation where the buyer may no longer possess certain needed skills. For example, the Air Force performs some CAs that at first glance can be totally

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[19] Ibid., p. 19.

[20] In Transaction Cost Economics, "specific assets" refers to those assets that would lose at least part of their value if used outside the specific relationship for which it was originally intended. An example would be a machine that produces the Chevrolet insignia that is placed on each of its vehicles. Assuming the machine could not be inexpensively modified to perform another equally lucrative task, the machine's value would fall dramatically if the contract with Chevrolet were terminated.

[21] Transaction Cost Economics (TCE) attempts to link the concept of bounded rationality (i.e., the idea that not all future occurrences can be foreseen, nor can the consequences associated with those occurrences be known, preventing "complete," or air-tight contracts from being developed) with opportunism (i.e., the notion that people will resort to nefarious measures to further their own self-interest at the expense of another's) to explain and predict behavior undertaken by each party in a transaction to protect themselves from the hazards associated with exchange relationships.

[22] Based on a survey of companies that had a potential use for specialized assets, only 40 percent responded that they were currently using or planning to use the specialized production technology.

outsourced, but due to mobility requirements may need to retain them in-house to ensure enough qualified military personnel are available to be deployed (e.g., medical personnel). In addition, when outsourcing an activity the buyer needs to perform an oversight function. Some knowledge of the outsourced function is required to adequately perform this function. To maintain and develop that knowledge, an organization may retain some of the workload in-house even while it outsources most of it. " 'Some companies have outsourced so much staff that they have no choice but to bring in consultants to evaluate and renegotiate deals gone bad,' says Eugene A. Procknow of Deloitte & Touche." (Byrne 1996, 27)

The difficulty in specifying requirements or identifying potential problems produces another risk. Outsourcing can only be successful to the extent that an enforceable contract expressing requirements, metrics, incentives, and disincentives can be written. If the responsibilities are too complex or too subtle to be effectively expressed in legally enforceable language, or if many potential problems cannot be anticipated for inclusion in the contract, then outsourcing is not an attractive option due to the lack of redress available if disagreements arise or performance is inadequate.

### 1.2.3 Strategic Sourcing as an Approach to Outsourcing

The Air Force's interest in strategic sourcing[23] may reduce the risk that accompanies outsourcing and alleviate the effects of an event when one does occur. Strategic sourcing means the Air Force will link sourcing decisions to its strategic plans and consider the overall performance of each available source, whether in-house or external, in its sourcing decisions. Overall performance includes quality, delivery, customer service, and product advancements, as well as cost. The use of "best value" procurement, where the technical level of performance is negotiated before the low-cost producer is selected, is a method with which the Air Force can implement a strategic sourcing policy.[24]

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[23] AFPD 38-6, *Outsourcing and Privatization,* states that strategic sourcing is "the cornerstone of the Air Force approach to outsourcing and privatization." (Dept of AF 1997, 8)

[24] According to the CAMIS database, four of the 58 competitions completed since March 1996 (through the first quarter of FY99) were awarded on a "best value" basis. This compares with zero between the first fiscal quarter of FY 1994 and March 1996. All four were completed between August and December 1998. This bears out a statement in a GAO report published in February 1998, "In the future, DoD officials expect to use best value criteria

## 1.3 Current Government Policy on Estimating Overhead Costs

OMB's Circular A-76 directs the Air Force (and all other Executive Branch agencies) to include in its bid an estimate of overhead costs and offers agencies two options to make the estimate. First, the Air Force can perform an analysis to determine actual overhead costs associated with the activity being competed and submit the study to the OMB for their approval,[25] or second, if the study is not performed or not approved, overhead costs can be estimated by multiplying the direct labor costs in the Government bid by 12 percent (.12).[26]

### 1.3.1 The A-76 Process and Treatment of Overhead

In general, the A-76 process consists of six major activities. They are to: (1) develop a performance work statement and quality assurance plan; (2) conduct a management study to determine the Government's most efficient organization (MEO); (3) develop a cost estimate for the MEO; (4) issue an invitation for bid (IFB) or a request for proposal (RFP);[27] (5) evaluate the proposals, compare the MEO bid with the best of the proposed contract or interservice support agreement price, and select the best proposal;[28] and (6) address all appeals submitted under the

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when performance standards are particularly important but not necessarily for more routine tasks, such as providing grass-cutting or dining hall services." (GAO 1998a, 12)

[25] *Circular A-76 Revised Supplemental Handbook*, March 1996 (updated through Transmittal Memorandum 20, June 1999), Part II, Chap 2, Section A, Para 2. (i.e., GAO 1996)

[26] *Circular A-76 Revised Supplemental Handbook*, March 1996 (updated through Transmittal Memorandum 20, June 1999), Part II, Chap 2, Section E, Para 3. (i.e., GAO 1996)

[27] An invitation for bids (IFB) refers to when the Government requests firm bids on the cost of performing a commercial activity. IFBs are normally issued for more routine commercial activities, such as grounds keeping or cafeteria operations, where the work process and requirements are well defined and enough potential contractors are available to support a competitive procurement. A request for proposals (RFP) is usually issued when the Government wants to pursue a negotiated, best value procurement. This type of process is used when competition is limited and/or the commercial activity involves higher levels of complexity, expertise, and risk.

[28] If the technical level of performance is not the same for the MEO and for the best of the proposed contract or interservice support agreements, the Air Force may choose to employ "best value" procurement. In this case, the MEO will be redesigned to meet the level of performance proposed by the best outside proposal. At that point, the MEO bid will be compared to the best of the proposals and the best overall proposal will be selected.

administrative appeals process, which is designed to ensure that all costs are fair, accurate, and calculated in the manner prescribed by the A-76 handbook. Steps (2), (3), and (5) are most relevant to this research, so discussion of the other steps will be omitted.

Upon announcing a competition, the Government activity reviews its organizational structure, staffing, and operating procedures to determine the most efficient and effective way of performing the activity with in-house staff. Based on this "most efficient and cost effective organization" (MEO), the Government develops a cost estimate and submits it to the selecting authority.

Circular A-76 structures the cost estimate to be the sum of five components: (1) direct personnel costs (e.g., salaries, fringe benefits, allowances), (2) material and supply costs (e.g., raw materials, parts, office supplies), (3) other specifically attributable costs (e.g., cost of capital, travel, rent), (4) overhead (e.g., operations overhead, general and administrative overhead), and (5) additional costs that are not properly classified in categories 1 through 4 (e.g., employee recruitment, training, relocation). As mentioned above, the fourth component, overhead, is calculated by multiplying the first component, direct personnel costs, by 12 percent (.12) unless the Air Force obtains OMB approval to use another cost factor.

OMB's A-76 guidance stipulates that the Government's in-house estimate wins the competition unless the private sector's offer meets a threshold of savings that is at least 10 percent of direct personnel costs or $10 million over the performance period.[29] OMB established this minimum cost differential to ensure that the Government would not contract out for "marginal estimated savings."[30] Although not stated in Circular A-76, another good reason for the cost differential is the possibility of a contractor underestimating the cost of performing an activity and submitting a low bid due to inexperience or unfamiliarity with the activity. As Williamson states, "The reason why outsiders are not on a parity with insiders is usually because outsiders lack firm-specific, task-specific, or transaction-specific experience." (1975, 31) Since government employees who have been performing the activity prior to the competition and,

[29] The length of the contract is generally considered to be the performance period. Depending on the type and details of the contract, however, this is not necessarily the case.

[30] *Circular A-76 Revised Supplemental Handbook*, March 1996 (updated through Transmittal Memorandum 20, June 1999), Part II, Chap 2, Section A, Para 8. (i.e., GAO 1996)

therefore, who are familiar with the activity's cost requirements will participate in developing the MEO's bid, it is less likely that the MEO's bid will underestimate the cost of performing the contract.

### 1.3.2 Effect of the Overhead and Outsourcing Decision Rules Combined

One component of the Government's (i.e., MEO) cost estimate is overhead costs. OMB's guidance is that absent a better estimate, 12 percent of the MEO's direct personnel costs will be used to estimate overhead costs. OMB's guidance also stipulates that the Government's in-house estimate wins the competition unless the private sector's offer meets a threshold of savings that is at least 10 percent of direct personnel costs[31] (or $10 million, but contracts to date have rarely been large enough to make a $10 million differential likely, although that could change if A-76 competitions are expanded). The effect of simultaneously applying these two rules to a competition is identical to a policy that directs the Government to use two percent of direct personnel costs as its estimate of overhead costs (i.e., 12 percent overhead estimate – 10 percent minimum cost differential), and eliminating the minimum cost differential (i.e., awarding the contract to the lowest bid). This is shown in Table 1-1, below.

**Table 1-1 - Effect of Combining the Overhead and Outsourcing Rules**

| A-76 Policy | Current Policy (% of MEO's DLC) | Equivalent Policy (% of MEO's DLC) |
|---|---|---|
| Overhead Rule | 12% | 2% |
| Minimum Cost Differential | 10% | 0% |

[31] An extreme example will clarify the Outsourcing Decision Rule. Assume the MEO bid is $1,000, $10 of which are DLC, $990 of which is the sum of materials, supplies, overhead, and all other non-DLC costs. A contractor bid of $999 (or less) will win the competition because it will be 10 percent of the MEO's DLC lower than the MEO bid (i.e., MEO bid – (10 percent)(MEO DLC) = 1,000 – (.1)(10) = 1,000 – 1 = 999).

## 1.4 Why OMB Chose 12 Percent to Estimate Overhead Costs

Overhead costs can be a significant factor when deciding if a commercial activity can be performed more economically by a contractor or the government.[32] In an effort to address private-sector concerns that federal agencies were not properly recognizing overhead in their A-76 proposals, and realizing the difficulty for each agency to develop its own overhead rate, OMB sought to develop a standardized rate. During this process OMB determined that government accounting processes and commercial-activity data systems did not contain the cost information needed to develop a standard rate, or a rate specific to individual activities or a particular region of the country.[33]

Lacking the necessary empirical data on which to base an overhead rate, OMB surveyed various representatives from government and the private sector to obtain their views on an appropriate rate. OMB settled on the 12 percent figure because it was near the midpoint of overhead rates suggested by government agencies and private sector groups.[34]

When OMB revised Circular A-76's Supplemental Handbook in March 1996, it directed the Air Force (and all other Executive Branch agencies) to include in its bid an estimate of overhead costs and offered the option of *either* using 12 percent of MEO DLCs as the estimate, regardless of the function being considered for outsourcing, its geographic location, the size of the base, activity being outsourced, or other variables, *or* performing its own analysis to determine a more accurate estimate of overhead costs associated with the activity being competed. Although there is controversy over the accuracy of the 12 percent estimate, due to the cost and difficulty of determining the actual overhead rate and receiving OMB approval, the Air Force has used the 12 percent rate in the majority of A-76 competitions since the inception of the rule.[35] Whereas the

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[32] "A recent study has shown that, although gains in profitability of up to 40 percent had been projected by corporations, improvement in some cases has been less than 10 percent." (Maromonte 1998, 1) Maromonte claims the differential between corporate projections and realized savings is due to unforeseen increases in overhead costs that offset savings in direct costs.

[33] *Defense Outsourcing: Better Data Needed to Support Overhead Rates for A-76 Studies.* (GAO 1998a)

[34] Ibid.

[35] According to the CAMIS database, the Air Force used the 12 percent rule in 39 of the 41 A-76 competitions initiated after March 1996 (i.e., the inception of the 12 percent rule).

Air Force has determined that the 12 percent rule has altered outsourcing decisions (see section 2.2), it has not analyzed the accuracy of the 12 percent rule. The main objective of this research is to perform this analysis.

The approach taken by OMB implies that establishing an OHR that was acceptable to both the private and public sectors was its primary objective, and that determining an accurate estimate of the government's actual OHR was an ancillary objective.[36] A likely secondary objective was to minimize OMB's cost in the process of establishing the OHR. Assuming this was the case, the decision to adopt an OHR that may not be accurate is consistent with organizational theory and could reasonably be expected from a bureaucratically-rational decision process where "goals are viewed as systems of constraints (Simon, 1964) which decisions must satisfy. Because of bounded rationality, search is limited and stops as soon as a satisfactory alternative is found. . . Conflict among different alternatives or points of view is never fully resolved, and priorities and objectives are attended to sequentially. . ." (Pfeffer 1996) The solution OMB settled on ameliorated private-sector concerns by raising the government's OHR while preventing public-sector objections by including the clause encouraging agencies to perform their own studies. It also minimized OMB's cost of establishing a government OHR (possibly at the expense of higher total costs to the government) by conducting a survey rather than performing arduous studies for each agency, and did not resolve the conflict between public and private sector estimates of the appropriate overhead rate.

### 1.4.1 Advantages and Disadvantages of the 12 Percent Rule[37]

From a "big picture" policy perspective, the lack of empirical data supporting the 12 percent rule does not preclude it from having some advantages. The 12 percent rule offers agencies an alternative that transforms a non-programmed decision into a programmed decision[38] and allows

[36] If determining actual overhead rates was OMB's primary objective, it could have directed each agency to perform a study to determine its OHR rather than merely "encouraging" it.

[37] This discussion assumes OMB has no knowledge of a more accurate method of estimating overhead costs (e.g., a more accurate OHR, another estimating base).

[38] Simon (1977) defines the degree to which a decision is programmed as the degree to which it is repetitive and routine. Programmed decisions have definite procedures for handling them and don't have to be treated "de novo"

them to avoid the costs of determining their actual overhead rates. If taken, this would decrease the cost of developing the government bid and, therefore, of performing the competition.[39]

The 12 percent rule also allows each agency to decide, within the context of its values and goals, if the additional accuracy obtained by performing a study is worth the cost. For example, if an agency's goal is to downsize its workforce or concentrate on its core competencies, accepting the 12 percent rule unquestioningly will help them accomplish it,[40] so the additional accuracy is not worth the cost of the study. If fairness to its employees or minimizing long-run cost is a predominant value, an agency may decide that performing a study is worth the cost.

In addition, the 12 percent rule could save the Government money, depending on the accuracy of the 12 percent estimate and the number of agencies that perform their own studies. Assuming people in each agency are more familiar with their agencies' overhead cost behavior than researchers from OMB, if only a few agencies perform their own studies it is likely that the overall cost to the government of performing the studies will be less than if OMB performed them. However, if many agencies were to perform their own studies, then it is possible that OMB (or some other single organization) could perform the studies for less. Having one organization perform all overhead studies could prevent duplication of effort among agencies by allowing the data collection instruments and OHC analysis tools developed for the first study to be used in subsequent studies, making those studies much quicker and less costly than if each agency performed their own.

The main disadvantage of the 12 percent rule is that it could result in erroneous outsourcing decisions (i.e., competitions that are not won by the low-cost producer) if the actual government overhead rate is not 12 percent (see section 2.2.2). In addition, for agencies whose main concern

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each time they occur. Non-programmed decisions are novel or unstructured. "There is no cut-and-dried method for handling the problem because it hasn't arisen before, or because its precise nature and structure are elusive or complex . . ." (p. 46)

[39] This shouldn't be confused with decreasing the cost of CA performance subsequent to the competition. As is discussed in section 2.2.2, the 12 percent rule could alter the outcome of a competition so the low-cost producer doesn't win the competition.

[40] Whatever the actual government OHR, the 12 percent rule will probably make it easier for agencies to outsource activities. Since 12 percent was the midpoint between government and private-sector suggested OHRs, it is assumed that government responses (and, therefore, OHRs used in A-76 competitions prior to the imposition of the 12 percent rule) were below 12 percent. According to the CAMIS database, the Air Force used OHRs below 12 percent for all A-76 competitions prior to the rule's inception.

is long-run cost, it could increase the cost of performing each competition if they chose to perform a study each time.

Another disadvantage is that even if the correct outsourcing decision is made, estimates of savings would be incorrect. This is important if the main motivation for performing A-76 competitions is to reduce costs. Whereas the cost of performing costly competitions may be justified if estimates of savings based on the 12 percent rule are accurate, the justification may disappear if true savings are actually negligible.

## 1.5 Overhead Cost - Definition

This research pertains specifically to commercial activities for which at least one of the motivations to outsource is to reduce costs. A successful (i.e., low cost) outsourcing decision requires an accurate estimate of what it costs to perform the function in-house. The costs associated with the performance of a function can be divided into two broad categories: (1) direct costs, and (2) indirect costs.

Direct costs are those that are 100 percent attributable to the performance of the function. They include all labor and capital that are completely committed to performing the function and, therefore, could be eliminated if the function were no longer performed without affecting the performance of any other function.

Indirect costs are also referred to as overhead costs.[41] Overhead, for the purposes of an A-76 competition, is supposed to include two types of costs: (1) operations overhead, which includes costs that are not 100 percent attributable to the activity under study, but are generally associated with the recurring management or support of the activity, and (2) general and administrative costs, which include the salaries, equipment, and work space related to headquarters management, accounting and finance support, personnel support, legal support, data processing support, facilities maintenance, and other common support services performed outside the

[41] *Cost Accounting: Creating Value for Management* (Maher 1997, 31).

activity, but in support of the activity. These costs are affected by the conversion of work to or from in-house, contract, or ISSA.[42]

If accurate estimates are not obtained for both direct and indirect costs, then basing outsourcing decisions on comparative cost competitions will produce incorrect savings estimates and, in some cases, may result in incorrect outsourcing decisions (i.e., decisions that increase costs to the government). Although the concept behind determining direct costs of government activities is fairly straightforward and guidance for collecting and estimating them is well documented, performing the analysis is time consuming. Estimating overhead costs, though, is more complex for a number of reasons. First, identifying all shared resources is not easy. Second, since overhead costs are, by definition, attributable to two or more functions and inseparable, calculating the portion of overhead that is incurred by each function is generally not an easy task. And third, there is not always agreement on the approach to use to calculate overhead costs.

## 1.6 Two Approaches to Calculate Overhead Cost

There are two reasonable approaches to calculating overhead costs associated with a commercial activity: (1) the cost allocation approach, and (2) the marginal cost approach. The cost allocation approach attempts to allocate an appropriate percentage of the total cost of each

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[42] *Circular A-76 Revised Supplemental Handbook*, March 1996 (updated through Transmittal Memorandum 20, June 1999) (i.e., GAO 1996) defines overhead as follows:

"1. While direct labor, supervision and material costs are prorated, as appropriate, to Lines 1 (personnel) and 2 (material and supply), overhead expenses, which include general management and administrative expenses, are entered on Line 4 (overhead).

2. Line 4 (overhead) includes two major categories of cost. The first is *operations overhead* and is defined as those costs that are not 100 percent attributable to the activity under study, but are generally associated with the recurring management or support of the activity. The second is *general and administrative overhead* and includes salaries, equipment, space and other activities related to headquarters management, accounting, personnel, legal support, data processing management and similar common services performed outside the activity, but in support of the activity. These costs are affected by the conversion of work to or from in-house, contract or ISSA.

3. For each year of the cost comparison, Line 4 (overhead) is calculated by multiplying Line 1 (personnel costs), including fringe, by 12 percent (.12) and entering the total on Line 4. If military personnel are included in Line 1, apply the 12 percent factor to civilian MEO Line 1 costs only. The composite military rate should include all military related overhead." (Part II, Chapter 2, Section E)

shared resource to each activity that uses the resource. The marginal cost approach attempts to determine the change in total overhead costs that would result if a specific management decision were implemented (e.g., discontinuing, initiating, or outsourcing an activity).

### 1.6.1 The Cost Allocation Approach

There are several common methods of allocating overhead costs to a product (good or service). Two will be presented here as reasonable representations of the concepts behind the cost allocation approach. The two methods presented here are: (1) normal costing, and (2) activity-based costing.

#### 1.6.1.1 Normal Costing

Normal costing is an accounting system that charges direct materials and direct labor to objects at actual costs and applies overhead using predetermined rates. (Maher 1997) Firms using the normal costing method classify overhead costs in one of four general categories of common costs and related allocation bases.

*Labor-related overhead costs.* These costs are usually allocated on the basis of number of employees, labor hours, wages paid, or similar labor criteria. Examples of overhead activities that could be allocated according to this scheme are payroll and custodial services, utilities, and health care costs because the marginal increase in these costs tends to be related to the number and type of individuals employed. These costs are allocated to all activities that use the overhead component in proportion to the percentage of the allocation base used in performing the activity.

*Machine-related overhead costs.* These costs are usually allocated on the basis of machine-hours, current value of machinery and equipment, number of machines, or similar machine-related criteria. Examples of overhead costs that could be allocated according to this scheme are maintenance, depreciation, and utilities costs because the marginal increase in these costs tends to be related to the number and types of machines employed. As with labor-related overhead

costs, these costs are allocated to all activities that use the overhead component in proportion to the percentage of the allocation base used in performing the activity.

*Occupancy-related overhead costs.* These overhead components are usually allocated on the basis of area, volume, or number of rooms occupied by the commercial activity, or similar space-related criteria. Examples of overhead activities that may be allocated according to this scheme are rent, heating, air conditioning, and building security because the marginal increase in these costs tends to be related to the area occupied. These costs are also allocated to the activities in proportion to the selected allocation base used in performing the activity.

*Service-related overhead costs.* These costs may be allocated on the basis of quantity, value, time, or similar service-related criteria. Examples of overhead costs that could be allocated according to this scheme are managerial activities and service organizations (e.g., payroll or publications departments). These costs are allocated to the various activities according to the percentage of the allocation base consumed as indicated by time sheets, units (i.e., widgets, people, organizations) produced or served, or value added.

There are three common approaches used to select the most appropriate allocation base for an overhead component.

*Causal relation.* If a cause-and-effect relation between the cost object and the cost is known, then a cost driver that reflects that cause-and-effect relationship can be used. For example, if maintenance on an aircraft is based on the number of flight hours, number of flight hours is a cost driver. Allocating maintenance costs to a particular flight based on that flight's hours is appropriate.

*Benefits received.* If a causal relation cannot be found, it is appropriate to select an allocation base that reflects benefits received. For example, the cost of employee training to improve customer service is not necessarily caused by a particular organization on base, but the quality of customer service might benefit if employees participate in a training program. In this case, the costs of employee training might be allocated based on the proportion of customers served from each organization on base.

*Reasonableness.* If an allocation base that reflects causality or benefits received cannot be found, then an allocation base that represents a "reasonable" cost allocation can be used. For

example, it is reasonable to allocate space-related costs, such as custodial services, on the basis of square feet cleaned.

In summary, normal costing multiplies a predetermined overhead rate by the actual inputs of the allocation base to allocate overhead costs to customer organizations. The most common cost allocation bases used in private industry to establish a predetermined overhead rate are direct labor hours and direct labor dollars, accounting for 62 percent (i.e., 31 percent each) of the companies surveyed. These bases can be used for either a good or service producing entity. Other popular cost allocation bases, generally associated with manufacturing entities, are machine hours (12 percent), units of production (5 percent), and direct material dollars (4 percent).[43]

#### 1.6.1.2 Activity-Based Costing

Activity-based costing (ABC) is also a common method of allocating indirect costs to products. The main difference between ABC and traditional costing methods (e.g., normal costing) is that ABC assigns costs to products based on several different activities, whereas the traditional methods assign costs to products based on only one or two different activities. In general, ABC provides more detailed information, enabling managers to make more informed decisions.

ABC is based on the concept that products consume activities and activities consume resources. ABC is a costing method that assigns costs first to activities, and then to the products based on each product's use of activities. An activity is any discrete task that an organization performs to make or deliver a product or service.

ABC consists of four steps: (1) identify the activities that consume resources, (2) identify the cost drivers associated with each activity, (3) compute a cost rate per cost driver unit or transaction, and (4) assign costs to products by multiplying the cost driver rate by the volume of the cost driver units consumed by the product.

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[43] J. Cohen and L. Paquette, "Management Accounting Practices: Perception of Controllers," *Journal of Cost Management,* Fall 1991. (Cohen and Paquette 1991)

For example, assume the Transportation Squadron maintains all vehicles on base. When allocating the cost of the Transportation Squadron to the various customer organizations on base, the normal costing method discussed earlier might use the number of vehicles each organization owns or, perhaps, the man-hours spent maintaining its vehicles as the allocation base. If man-hours is the allocation base, then the number of man-hours spent maintaining each vehicle is recorded and multiplied by some predetermined rate (e.g., $20/hour) regardless of the type of work being performed. The resulting dollar value is then attributed to the organization that owns the vehicle.

ABC will go into more detail. It identifies the maintenance activities that consume resources, for example oil changes, tune-ups, and tire changes. It then examines the cost drivers for each of these activities and computes the cost per activity. The cost drivers for oil changes, for instance, may be man-hours and oil. For the base commander's car, assume an oil change requires .25 man-hours at $20/hour and 5 quarts of oil at one dollar/quart. So an oil change for the base commander's car will be assigned a cost of $10 (i.e., .25 x $20 + 5 x $1). Further assume an oil change for a forklift requires .2 man-hours and 3 quarts of a higher grade oil costing three dollars/quart. So an oil change for a forklift will be assigned a cost of $13 (i.e., .2 x $20 + 3 x $3). The last step is to multiply each cost driver rate by the units consumed by the product. So the base commander's car, which requires an oil change twice a year, would be allocated $20 per year (i.e., 2 x $10) while a forklift, which requires an oil change every month, would be allocated $156 per year (i.e., 12 x $13). ABC will repeat this process for tune-ups and tire changes (i.e., all other maintenance activities that consume resources), then allocate the total cost for these resource-consuming activities to the vehicles, as well. Once the cost of maintaining each vehicle is known, the cost of running the Transportation Squadron can be allocated to the customer organizations in accordance with the costs they actually incur.

In summary, ABC multiplies the actual overhead rate by the actual inputs to allocate overhead costs to customer organizations. The Air Force has completed several ABC studies and has numerous more studies underway.[44]

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[44] Assistant Secretary of the Air Force (Financial Management & Comptroller) (SAF/FMCE) slide show (i.e., Powerpoint presentation) on website www.saffm.hq.af.mil

#### 1.6.1.3 The Motivation for Cost Allocation

In industry, the primary reason for allocating overhead costs is to enable managers to make pricing and production decisions based on the actual cost of its products. If the allocation process is incorrect, then producers will be willing to sell their products at prices either higher or lower than those they would be willing to sell them for given the actual production cost. To the extent that market prices are a signal to the producer indicating the quantity that should be produced, performing painstaking and meticulous overhead cost allocation may be a beneficial activity. But this assumes an efficient market and demand for the product that is sensitive to its price. This is generally not the case on Air Force bases. It also assumes that the excess capacity created in overhead activities as a result of a product being produced in smaller quantities or discontinued will be eliminated. Otherwise, expending resources to determine appropriate allocation percentages would be senseless because the additional information would add no value. Overhead costs would be fixed costs, immutable regardless of whether a product is produced or not and, therefore, would not be considered in the pricing decision. This assumption (i.e., excess capacity in overhead activities will be eliminated) is not valid for the government, either.

Consequently, using the cost allocation approach of estimating overhead costs to be included in A-76 competitions either assumes that all overhead costs allocated to the outsourced function will be eliminated, or it considers the actual cost savings to the government from the competition to be irrelevant to the decision process.

### 1.6.2 The Marginal Cost Approach

The marginal cost approach attempts to determine the incremental increase or decrease in overhead costs that would be incurred if a particular management decision were implemented. Unlike the cost allocation approach, it attempts to separate the fixed and variable components of overhead cost. For example, if a firm produces 10 products in one building, then discontinuing the production of one product, or initiating production of an $11^{th}$, will not change the rent the firm pays for the building. Therefore, since the rent will not be affected by the decision to

produce one less or one more product, it is fixed with respect to the decision. However, utility costs, building maintenance, building management, and administrative costs (e.g., labor and non-labor costs for the payroll and purchasing departments) may change as a result of the decision and, therefore, are variable with respect to the decision.

#### 1.6.2.1 The Motivation for Marginal Costing

If the objective of an A-76 competition is to minimize government costs, then what is important is not the overhead rate that best estimates total government overhead costs, but rather the overhead rate that best estimates the overhead costs that *will be eliminated* if the function is outsourced. "A basic management principle is derived from a simple economic principle – in managerial decision making, *relevant costs are marginal costs.* Only the costs that will change are relevant for any managerial decision."[45] The marginal cost approach recognizes that, for a number of reasons (e.g., government employment policies, real property costs, overhead "step" functions[46]), the government may not be able to reduce overhead costs at all when a CA is outsourced.

The GAO adopted the marginal cost approach when it reviewed the competition procedures for C-5 depot maintenance. Robins AFB, the sole public sector competitor for the C-5 workload, reduced its overhead estimate by $153 million because "the evaluation showed that Warner Robins, due to its excess capacity, could absorb the additional C-5 workload with no significant increase in total overhead costs and that the overhead was primarily a fixed-cost that would be incurred with or without the additional workload..."[47] The GAO review showed that the award resulted in the lowest cost to the government given the assumptions and conditions at the time of

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[45] "Economic Choices With ABC," *Management Accounting* (Woods 1992).

[46] Since the resources that are considered to be overhead are not 100 percent attributable to any one activity, eliminating one activity may not allow the resource to be eliminated without affecting the performance of other activities. Consequently, several functions may have to be outsourced before overhead resources can be eliminated. The concept of having constant overhead costs until several functions are outsourced, then having a sudden reduction in costs upon the outsourcing of the next function can be modeled using "step" functions.

[47] *Public-Private Competitions: Processes Used for C-5 Aircraft Award Appear Reasonable* (GAO 1998).

award. In the GAO's view, the important issue in the competition was the actual change in government costs.

Applying the same logic to outsourcing competitions, the important issue is the actual reduction in government costs. Therefore, the marginal overhead cost approach is the more appropriate approach to use in A-76 competitions.

It can be argued that it is unfair to penalize private offerors for the government's employment policies and inefficiencies and, indeed, that argument was made by private sector bidders in the C-5 competition. It can further be argued that this policy could encourage the government to remain inefficient. The solution to these problems, however, is not to make the government less efficient by considering a government overhead rate in competitions that is based on total overhead costs, thereby leading to more functions being outsourced, even when government costs might increase as a result, but rather to alter the government policies that prevent it from reducing overhead costs. Until changes are made in the policies that prevent the government from reducing overhead costs when a function is outsourced, then including the government's actual overhead rate in the estimate of its cost to perform a function is irrelevant since that does not represent the savings that will be realized by outsourcing.

# Chapter 2 Problem and Objective

## 2.1 Problem Statement

Currently, when the Air Force reviews an activity for outsourcing it uses a flat 12 percent of MEO direct labor costs to estimate the cost of overhead, regardless of the function being considered for outsourcing, its geographic location, the size of the base or activity being outsourced, whether the contractor will reside on base or off, or other variables. However, there is no analytical basis to support the 12 percent estimate.

If the 12 percent estimate is inaccurate, the cost of performing functions in-house that incur less than a 12 percent overhead rate will be overestimated, thereby increasing the probability of outsourcing those functions to a more costly producer of the good or service. Conversely, the cost of performing functions that incur a higher than 12 percent overhead rate will be underestimated, thereby reducing the probability of outsourcing those functions and realizing the potential savings. These mistakes can result in tens of millions of dollars,[1] especially since the Department of Defense (DoD) has announced plans to conduct A-76 competitions involving over 170,000 positions from FY99 through FY05.[2] An analysis of the effect of the 12 percent rule follows to show when this policy can cause erroneous outsourcing decisions and how costly mistakes can be.

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[1] Assuming all MEOs have the same number of authorizations, a formula to calculate the dollar loss from overhead labor costs (i.e., overhead non-labor costs are not included in the estimate) from erroneous outsourcing decisions is [(total number of MEO authorizations) x (percent of support authorizations eliminated per MEO authorization outsourced) x (percent of erroneous outsourcing decisions) x (annual DLC per MEO position)]. Assuming: (1) three support authorizations are eliminated for every 100 MEO authorizations outsourced (see the Base Support Tail discussion in section 5.1 to see this is a conservative estimate); (2) 170,000 precompetitive commercial activity authorizations will be reduced to approximately 127,500 MEO authorizations (i.e., 170,000 x .75 - see section 3.2.4.7 for a discussion of how the .75 transformation rate was derived); (3) the erroneous outsourcing decision rate is .429 percent (see section 2.2 for a discussion of the 3-out-of-7-competitions erroneous decision rate); and (4) each support authorization incurs an average of $50,000 in DLCs, the dollar loss in overhead labor costs alone would be 127,500 x .03 x .429 x 50,000 = $82,046,250.

[2] According to the *Defense Reform Update 1999* (DoD 1999), the FY00 budget provides for the competition of nearly 229,000 positions between FY97 and FY05. It also states that over 26,000 and 32,000 positions were competed under the A-76 process in FY97 and FY98, respectively. This leaves approximately 170,000 positions to be competed from FY99 and FY05 for a cumulative total of 229,000.

## 2.2 Analysis of the Effect of the 12 Percent Rule

Prior to the 12 percent rule taking effect, approximately half of A-76 competitions were won in-house. At the request of the General Accounting Office (GAO), the Air Force analyzed 33 competitions completed between January 1990 to October 1996 (i.e., prior to the establishment of the 12 percent rate) that were won in-house. The analysis determined that 12 of the 33 would have been won by the private sector had the 12 percent rate been in effect. The analysis also analyzed seven competitions performed after the 12 percent rate went into effect, six of which were outsourced. It determined that up to three of the six might have been won in-house if the 12 percent rate had not been in effect.[3] Assuming the competition won by the government was correct (i.e., it was the low cost decision), this means that the 12 percent rule could cause up to 42.9 percent (i.e., 3 out of 7) of competitions to be awarded erroneously.

Clearly, the 12 percent rate has altered the outcomes of a significant percentage of A-76 competitions. Therefore, it is important to understand the effect the 12 percent rule has on the outcome of outsourcing decisions. The effect of the 12 percent rule can be determined by analyzing the distortions it introduces into the A-76 competition process.

### 2.2.1 DLC/DC Ratio and the Total Cost Line

By choosing MEO direct labor costs as the allocation base, the OMB is claiming there is a relationship between direct labor costs and overhead costs.[4] Assuming this relationship exists, an analysis can be performed based on the ratio of Government direct labor costs to total Government direct costs (DLC/DC ratio), the actual Government overhead rate (AGOR) with respect to direct labor costs, and the contractor's bid.

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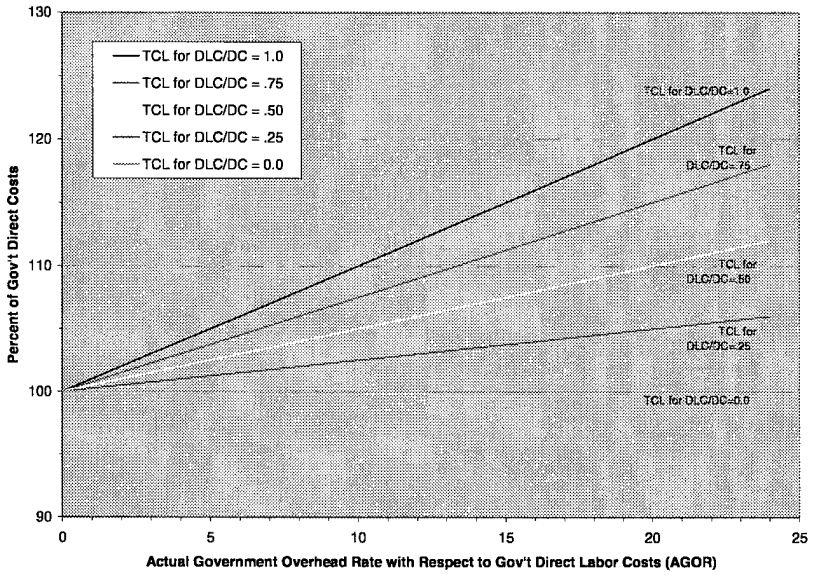
[3] *Defense Outsourcing: Better Data Needed to Support Overhead Rates for A-76 Studies* (GAO 1998a).

[4] Using 12 percent of MEO direct labor costs to estimate government overhead costs for inclusion in its bid has more significance than a mere cost allocation exercise. The approach OMB used to develop the 12 percent rate, outlined in section 1.4, indicates it believes there is a relationship between MEO direct labor costs and overhead costs. If this were not the case, OMB could have suggested a number of other allocation bases, or a composite of bases, that it thought was a better predictor of overhead costs.

A DLC/DC ratio is obtained by dividing the Government's direct labor cost (DLC) by the Government's total direct costs (DC) (i.e., direct labor costs + direct non-labor costs). This ratio can take any value in the range from 0 to 1, inclusive. If this ratio equals 1.0, then all direct costs for the activity are labor costs. If this ratio equals 0, then the activity has no direct labor costs; all direct costs are non-labor costs (e.g., machinery, materials). If this ratio is between 0 and 1, then the activity has both direct labor and direct non-labor costs (DNLC). For example, if the activity has direct labor costs of $75,000 and direct non-labor costs of $25,000, the function has a DLC/DC ratio of .75 (i.e., $75,000 / ($75,000 + 25,000)).

**Figure 2-1 - Government Total Cost Lines for Various DLC/DC Ratios**




Every DLC/DC ratio defines a "total cost line." This line shows the total cost of the activity as a percent of Government direct costs on the vertical axis, and the AGOR on the horizontal axis. That is, the line is the set of points that represents the cost to the Government for performing an activity in-house for all possible AGORs. Figure 2-1 contains five total cost lines, each for a different DLC/DC ratio.

The general formula for the total cost line, given the Government's DLC, DNLC, and AGOR, is the sum of overhead costs, as a percentage of DLC (i.e., DLC * AGOR / 100), and total direct

costs (i.e., DLC + DNLC), divided by total direct costs (i.e., DLC + DNLC). Mathematically, the equation for a total cost line (TCL) can be expressed as:

(1) $$TCL = \{[(DLC * AGOR / 100) + (DLC + DNLC)]\} * 100 / (DLC + DNLC)$$

This simplifies to:

(2) $$TCL = (DLC / DC) * AGOR + 100$$

As indicated by equation (2) above for a total cost line, the y-intercept is 100 (reflecting the obvious fact that DC = 100 percent of DC), the DLC/DC ratio is the slope, and the AGOR is the independent variable measured along the x-axis. Two examples illustrating the use of the total cost equation follow.

Example 1. For an activity with direct labor costs of $75,000, direct non-labor costs of $25,000, and an AGOR of 16 percent, the TCL = [75,000 / (75,000 + 25,000)] * 16 + 100 = (75,000 / 100,000) * 16 + 100 = .75 * 16 + 100 = 12 + 100 = 112. This means that with a DLC/DC ratio of .75 and an AGOR of 16 percent, the Government can perform the function for 112 percent of its direct costs. If the contractor's bid is less than 112 percent of the Government's direct costs, the Government can save money if it outsources the function. If the contractor's bid is greater than 112 percent of direct costs, the Government can perform the function in-house for a lower cost than if it outsources the function.

Example 2. For an activity with direct labor costs of $50,000, direct non-labor costs of $25,000, and an AGOR of 6 percent, the TCL = [50,000 / (50,000 + 25,000)] * 6 + 100 = (50,000 / 75,000) * 6 + 100 = .67 * 6 + 100 = 4 + 100 = 104. This means that with a DLC/DC ratio of .67 and an AGOR of 6 percent, the Government can perform the function for 104 percent of its direct costs. If the contractor's bid is less than 104 percent of the Government's direct costs, the Government can save money if it outsources the function. If the contractor's bid is greater than 104 percent of direct costs, the Government can perform the function in-house for a lower cost than if it outsources the function.

Another way to interpret the total cost line is that it is the boundary between the area where the Government can perform the function for less than the contractor bid and the area where the contractor bid is less than the Government's cost of performing the function. Specifically, if the contractor's bid lies to the upper left of the total cost line, the government can perform the function at a lower cost. If the contractor's bid lies to the lower right of the total cost line, the contractor can perform the function at a lower cost.

For example, if the DLC/DC ratio is 0.50 (i.e., direct labor costs for the activity equals direct non-labor costs), then an actual Government overhead rate of five percent of DLC (i.e., total Government cost equal to 102.5 percent of DC[5]) and a contractor bid equal to 104 percent of Government direct costs would lie above the DLC/DC = 0.50 total cost line. That means the government can perform the function in-house at a lower cost than if it were outsourced. Conversely, a contractor's bid equal to 102 percent of the Government's direct costs would lie below the DLC/DC = 0.50 total cost line, meaning the Government can save money by outsourcing the function.

### 2.2.2 The Decision Line

The next step is to analyze the effect the 12 percent rule has on outsourcing decisions, or how it affects the "decision line." The decision line (DL) is defined as the line (i.e., boundary) between the area where the government will win the A-76 competition under the 12 percent rule and the area where the contractor will win. Without the 12 percent rule, the total cost and decision lines are the same. The following discussion of the DLC/DC = .75 case will show how the 12 percent rule distorts the decision line with respect to the total cost line.

Effect of the 12 Percent Rule in the DLC/DC = .75 Case

As can be observed in Figure 2-1, the graphical representation of the total cost line will always intersect the y-axis at point (0, 100) and have an upward slope equal to the DLC/DC ratio.

[5] Total Government cost is equal to 100 percent of direct costs + (DLC/DC * AGOR) = 1 + (.5 * 5) = 102.5 percent of DC.

Figures 2-2 and 2-3 illustrate the effect of the 12 percent rule in the DLC/DC = .75 case. Figure 2-2 displays the TCL and the DL. The TCL intersects the y-axis at (0, 100) and has a slope of .75. The DL, as will be described shortly, is a horizontal line (i.e., slope = 0) at y = 109. In Figure 2-3, Regions A and B represent the distortions in the outsourcing process that the 12 percent rule introduces. Without the 12 percent rule (i.e., actual Government overhead rate is used) the Government would win all competitions where the contractor bid (expressed as a percentage of total government direct costs) lies above the total cost line, including all points within region A. The effect of the 12 percent rule is that competitions with AGOR-contractor bid combinations that fall within region A are no longer won by the Government; they will be won by the contractor. That is, competitions that fall within region A are transferred from the Government to the contractor.

Figure 2-2 - Gov't Total Cost and Gov't Bid Lines for DLC/DC = .75

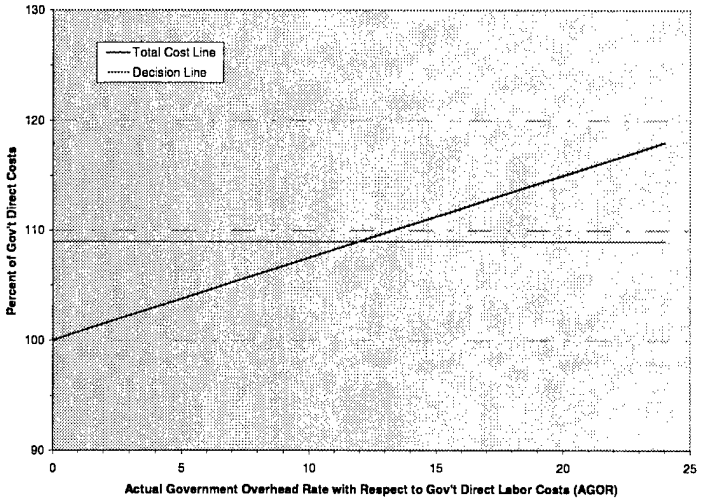
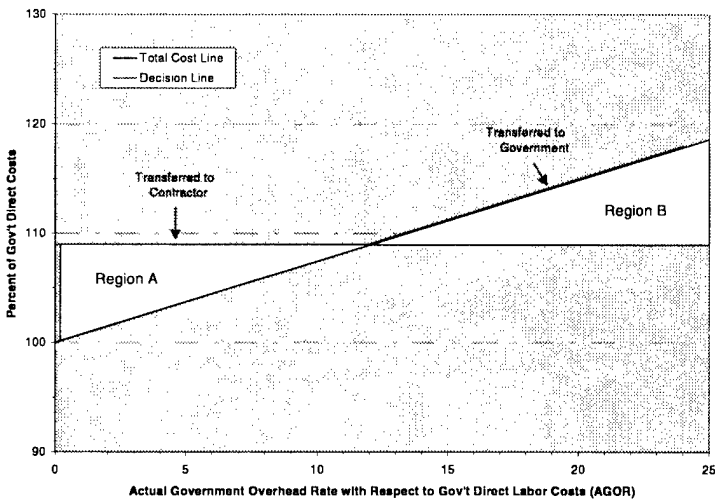



Figure 2-3 - Gov't Total Cost and Gov't Bid Lines for DLC/DC = .75




For example, with a Government overhead rate of 2 percent (i.e., Government bid of 101.5 percent of Government direct costs) and a contractor bid of 105 percent of Government direct costs, it is clear the Government should win this competition; it can perform the function for a lower cost that the contractor's bid. However, since the Government is directed to use 12 percent of DLC as its overhead rate, the A-76 process will estimate government costs to be 109 percent of the Government's total direct costs (i.e., 100 percent of DC + 12 percent of DLC as the

overhead rate). Upon comparing this to the contractor's bid of 105 percent of Government direct costs, this function, as well as all other functions that fall within region A, will be outsourced even though the Government can perform it in-house for a lower cost. This concept is applicable for all AGOR-contractor bid combinations that fall within region A. The distortion (i.e., the difference between the total cost and decision lines) gets larger as the AGOR falls from 12 percent to zero.

Region B is the opposite of region A. That is, without the 12 percent rule the contractor should win all competitions for which their bids fall below the total cost line, including all points within region B. The effect of the 12 percent rule is that competitions with AGOR-contractor bid combinations that fall within region B are no longer won by the contractor; they will be won by the Government. That is, competitions that fall within region B are transferred from the contractor to the Government.

For example, using a Government overhead rate of 25 percent and a contractor bid of 115 percent of Government direct costs, the contractor's bid is below the total Government cost (i.e., 118.75 percent of Government direct costs) of performing the function and, therefore, should win the competition. However, since the Government is directed to use 12 percent of DLC as its overhead rate, the A-76 process would again estimate Government costs to be 109 percent of the Government's direct costs. Upon comparing this to the contractor's bid of 115 percent of Government direct costs, this function, as well as all other functions that fall within region B, will be kept in-house even though outsourcing it will reduce costs. This concept is applicable for all AGOR-contractor bid combinations that fall within region B. The distortion (i.e., the difference between the total cost and decision lines) gets larger as the AGOR increases from 12 percent.

In summary, the 12 percent rule decouples the AGOR from the government bid resulting in an outsourcing decision that is independent of the AGOR. The 12 percent rule dictates that the Government's bid will be 109 percent of its direct costs regardless of its actual overhead rate. As long as the contractor's bid is less than 109 percent of the Government's direct costs, the contractor will win the competition. Conversely, if the contractor's bid is greater than or equal to 109 percent of the Government's direct costs, the Government will win the competition. So for a

DLC/DC ratio of .75, the decision line (DL) is a horizontal line at 109 percent of Government direct costs.

Consequently, the 12 percent rule punishes the Government (i.e., favors the contractor) if its actual overhead rate is less than 12 percent and rewards the Government (i.e., works against the contractor) if its overhead rate is greater than 12 percent. Of course, the outsourcing decision will only be adversely affected if the contractor's bid falls within region A or region B in Figure 2-3. They show the effect of the 12 percent rule is that the decision line is altered from being the same as the total cost line as follows:

Without 12 percent rule: $DL = TCL = 100 + (DCL / DC)\ (AGOR) = 100 + (.75)\ (AGOR)$

With 12 percent rule: $DL = 100 + (DCL / DC)\ (12) = 100 + (.75)\ (12) = 109$

This analysis, specific to the DLC/DC = .75 case, can be applied to TCLs with other DLC/DC ratios. The only difference will be the size of regions A and B. The TCL will always intersect the y-axis at point (0, 100) and have an upward slope equal to the DLC/DC ratio. The DL will always be a horizontal line at a percentage equal to (DLC/DC) * 12 percent of direct labor costs above (0, 100) (i.e., 100 + (DLC/DC) * (12)). The TCL and DL will always intersect when the AGOR = 12 percent. Consequently, as the DLC/DC ratio falls from 1 to 0, the sizes of regions A and B get progressively smaller until, when the DLC/DC ratio equals 0, regions A and B are both eliminated (i.e., the DL and TCL are identical because all costs are DNLCs). This is because 12 percent of a decreasing percentage becomes increasingly less significant. Figures 2-4 through 2-8 illustrate the effect a decreasing DLC/DC ratio has in the size of regions A and B by displaying total cost and decision lines for DLC/DC ratios 1.0, .75, .50, .25, and 0.0.

Figure 2-4 - Gov't Total Cost and Gov't Bid Lines for DLC/DC = 1.0

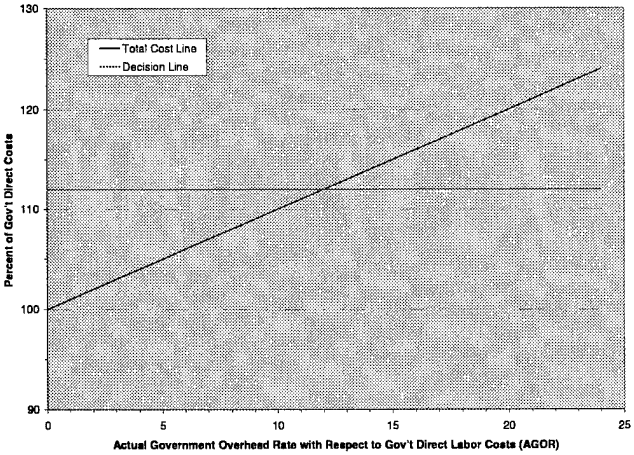



Figure 2-5 - Gov't Total Cost and Gov't Bid Lines for DLC/DC = .75

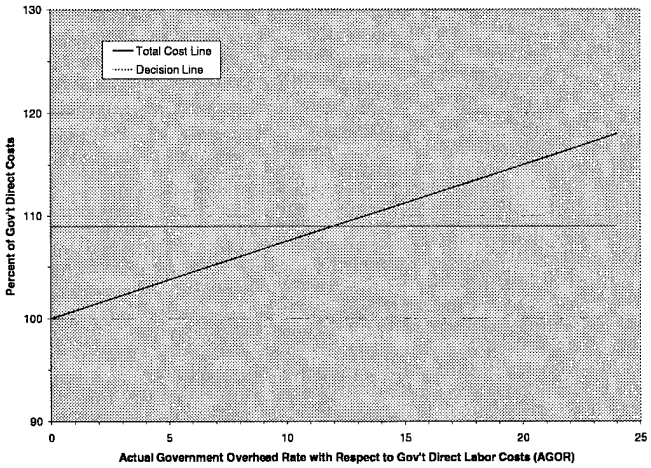



Figure 2-6 - Gov't Total Cost and Gov't Bid Lines for DLC/DC = .50

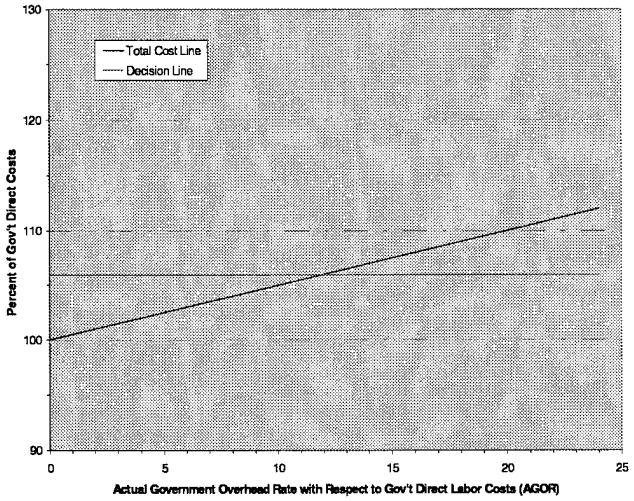



Figure 2-7 - Gov't Total Cost and Gov't Bid Lines for DLC/DC = .25

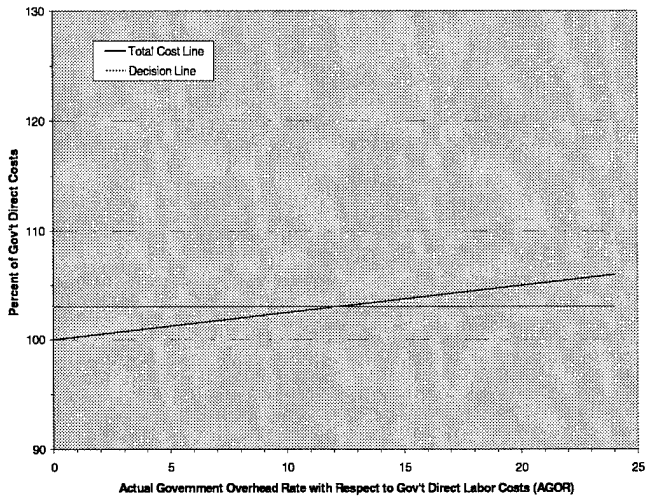
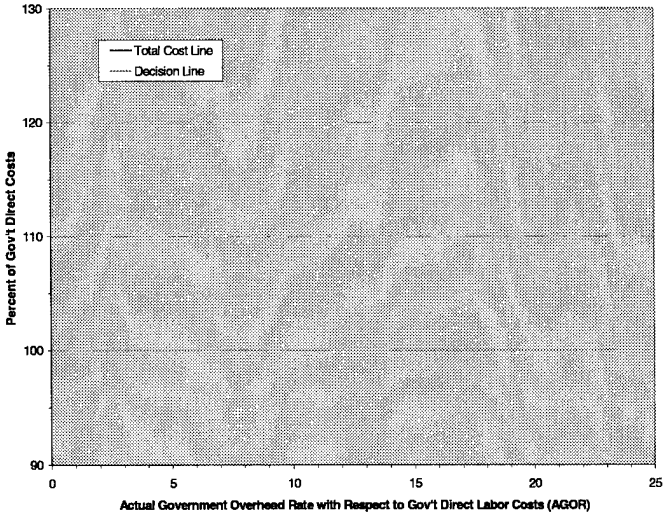



Figure 2-8 - Gov't Total Cost and Gov't Bid Lines for DLC/DC = 0.0



## 2.3 Effect of the Overhead and Outsourcing Decision Rules Combined

As mentioned earlier (section 1.3.2), OMB's guidance stipulates that the Government's in-house estimate wins the competition unless the private sector's offer meets a threshold of savings that is at least 10 percent of direct personnel costs (or $10 million, but contracts rarely are large enough to make a $10 million differential likely). The effect of simultaneously applying the 12 percent overhead rule and the 10 percent minimum cost differential rules to a competition is identical to the Government using two percent of direct personnel costs to estimate overhead costs (i.e., 12 percent overhead estimate – 10 percent minimum cost differential), and awarding the contract to the lowest bid (i.e., no minimum cost differential). This was shown in tabular form in Table 1-1. Figures 2-9 and 2-10 express this graphically for DLC/DC ratios of 1.0 and 0.5, respectively.

Figure 2-9 modifies Figure 2-4 by adding the effect of the 10 percent minimum cost differential rule (i.e., DLC/DC = 1.0), and Figure 2-10 modifies Figure 2-6 (i.e., DLC/DC = .5). As depicted in the graphs, the only difference is that the DL is moved down in a parallel manner by an amount equal to 10 percent of DLC. The DL will still be a horizontal line, but it will be at y = (DLC/DC) * 2 percent above (0, 100) (i.e., 100 + (DLC/DC) * (2)). The TCL will not be affected. The result is that the TCL and DL will now always intersect when the AGOR = 2 percent. The result will be that Region A would be reduced (by 97.2 percent) and Region B would be enlarged. Although Region B would not be enlarged by the same percentage that Region A would be reduced by, it would be enlarged by the same absolute amount that Region A would be reduced by.

This research focuses on the issue of estimating overhead costs associated with outsourcing decisions. If the goal of an A-76 competition is to lower total Government costs, then reducing overhead costs is only part of the problem. In some competitions, reductions in direct costs may be so large that they overshadow any overhead effects that result from the competition. For competitions where this is the case, then the results of this study become secondary. However, for the potentially large percentage of competitions where the 12 percent rule affects the outcome, a more accurate estimate of government OHC reductions may help decision makers choose the provider that minimizes total government costs.

Figure 2-9 - Gov't Total Cost and Decision Curves for DLC/DC = 1.0, Including the 10 Percent Minimum Cost Differential

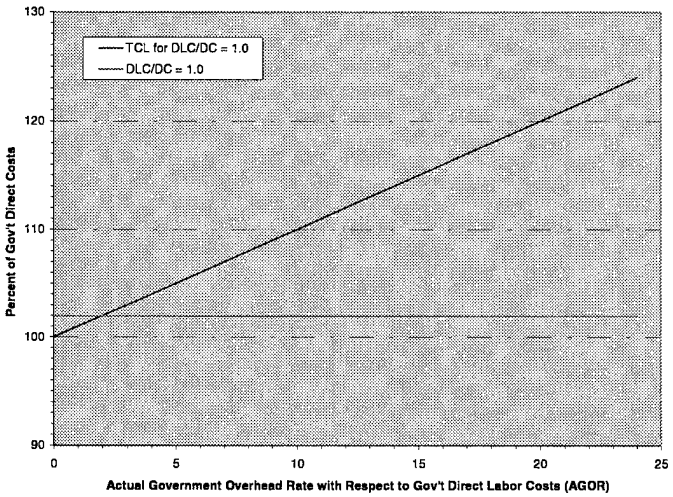
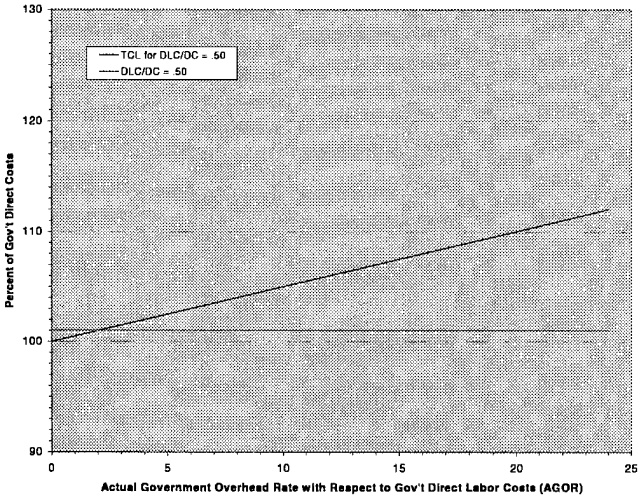



Figure 2-10 - Gov't Total Cost and Decision Curves for DLC/DC = .50, Including the 10 Percent Minimum Cost Differential




## 2.4 Objective

This research has three objectives: (1) to develop a generic framework for viewing overhead costs in Air Force A-76 competitions, (2) to apply the framework at a representative Air Force base to test the validity of the OMB 12 percent rule, and (3) to implement an automated procedure to improve estimates of overhead cost savings that would result from Air Force A-76 competitions.

The generic framework will provide a systematic view of what overhead is at an Air Force base and the portion of overhead that is relevant when conducting an A-76 competition. To this end, it addresses the issue of separating fixed and variable overhead costs with respect to the decision to outsource a CA or retain it in-house.

The researcher will then apply this framework to a case-study Air Force base. The methodology employed will estimate the marginal overhead costs associated with each CA on the case-study base and the actual government OHR associated with them.

Finally, an automated procedure will be developed to estimate the overhead savings that would result from any outsourcing decision conducted at the case-study base. However, the procedure will be "customizable" for any Air Force base by using readily available data (e.g.,

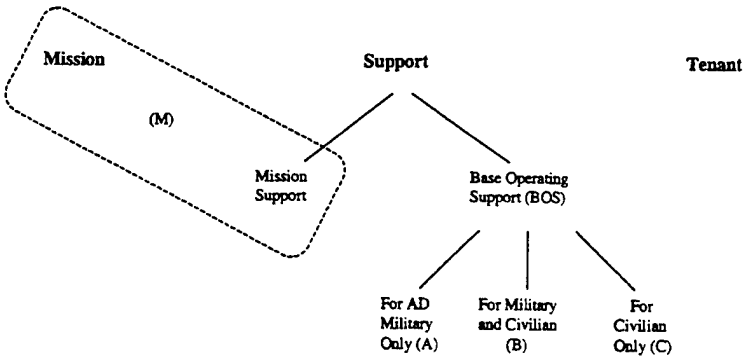
manpower authorizations). This procedure will provide a fairly inexpensive method of estimating OHC that are relevant in outsourcing decisions.

# Chapter 3 Approach

In order to calculate overhead, it is necessary to identify the cost objects to which costs are assigned. A cost object is any end (e.g., good, service, organization, customer) to which a cost is assigned. Examples of possible cost objects in the Air Force are an aircraft, a squadron or flight, an Air Force base, or a weapon system. Any cost that is 100 percent attributable to a cost object is a direct cost of that cost object. Costs that contribute to a cost object but cannot be totally attributed to it are indirect costs, or overhead with respect to that cost object. Many indirect costs result from several organizations sharing facilities (e.g., buildings, equipment) or services (e.g., data processing, maintenance staff). Cost objects must be identified because a cost may be direct to one cost object and indirect to another. For example, the salary of a supervisor in an air depot maintenance facility is a direct cost of the maintenance facility, but an indirect cost of the individual aircraft maintained. Since the 12 percent rule is intended to estimate overhead costs related to a MEO, the cost object for this research will be the MEO being competed for outsourcing.

The Air Force usually classifies base activities as either mission, support, or tenant. Figure 3-1 illustrates the taxonomy that is used in the generic framework and this study. A mission activity is an activity for which the base exists. Examples of mission activities are combat, transport, intelligence collection, and training. A support activity is an ancillary activity that either directly or indirectly contributes to the performance of a mission activity by supporting personnel or equipment. Support activities can be divided into two types, mission support and base operating support (BOS). Examples of mission support activities are aircraft maintenance and fuels management. BOS activities can further be separated into three types: (1) those that benefit or are available only to military personnel on base, (2) those that benefit or are available only to civilian personnel, and (3) those that benefit or are available to everybody (i.e., military and civilian personnel). Base housing is an example of the first type, the civilian pay office is an example of the second, and the base security police is an example of the third. A tenant activity is one which is not part of the host wing and generally does not contribute to the base's mission. In many cases there is no reason the tenant unit is on the base other than it has to be somewhere.

Figure 3-1 - Taxonomy of Base Activities for OHR Calculation




## 3.1 A Generic Framework

### 3.1.1 Taxonomy of Base Activities for Overhead Rate Calculation

A generic framework for calculating overhead costs for an activity is presented in Table 3-1. Using the symbol M to represent a mission or mission support activity (M), the symbols A, C, and B to represent support activities available only to military personnel (i.e., A for active duty), available only to civilians (C), and available to both (B), respectively, and the symbol T to represent a tenant activity (T), all base activities can be represented as follows:

$$M_1, M_2,\ldots, M_v, A_1, A_2,\ldots, A_w, C_1, C_2,\ldots, C_x, B_1, B_2 ,\ldots, B_y, T_1, T_2 ,\ldots, T_z$$

where v is the number of base mission and mission support activities, w is the number of base support functions available only to military personnel, x is the number of base support functions available only to civilian personnel, y is the number of base support functions available to both military and civilian personnel, and z is the number of tenant activities. MEO overhead costs include all activities and costs that benefit the MEO that are not direct costs to the MEO. This

includes all direct and joint costs for relevant support activities and common costs for the entire base.

**Table 3-1 – Generic Overhead Cost Calculation Framework**

| Composition of MEO | Types of Costs | | | | | |
|---|---|---|---|---|---|---|
| | Mission/Mission Spt Units (M) | Military Spt Units (A) | Support Units (Mil & Civ) (B) | Civilian Spt Units (C) | Base Common Costs (e.g., water, elec, etc.) | Tenant Units (T) |
| MEO w/ civilians only | NR | NR | O | O | O | NR |
| MEO w/ civ & mil | NR | O | O | O | O | NR |
| MEO w/ military only | NR | O | O | NR | O | NR |

O = Overhead Cost NR = Not Relevant

Interpreting Table 3-1, if the overhead cost calculation is for an A-76 competition where the MEO consists only of civilian personnel, overhead costs will include all direct and joint costs of B and C units, as well as all base common costs. Direct costs of M, A, and T units are irrelevant to the calculation because they are not part of the MEO (i.e., they are not direct costs to the MEO), nor do they support the MEO in any way (e.g., personnel, machines, etc.). Consequently, outsourcing the MEO would have no effect on the cost of maintaining M, A, and T units.

If the overhead cost calculation is for an A-76 competition where the MEO consists of both civilian and military personnel, overhead costs will include all direct and joint costs of A, B and C units, as well as all base common costs. Direct costs of M and T units are irrelevant to the calculation because they are not part of the MEO, nor do they support the MEO in any way. Consequently, outsourcing the MEO would have no effect on the cost of maintaining M and T units.

Following similar logic, if the overhead cost calculation is for an A-76 competition where the MEO consists only of military personnel, overhead costs will include all direct and joint costs of A and B units, as well as all base common costs. Direct costs of M, C, and T units are irrelevant to the calculation because they are not part of the MEO, nor do they support the MEO in any

way. Consequently, outsourcing the MEO would have no effect on the cost of maintaining M, C, and T units.

This taxonomy of Air Force base activities and the generic framework are consistent with Circular A-76's definition of overhead (see section 1.5). For a given composition of MEO, all operations overhead and general and administrative overhead costs incurred on a base in support of the MEO will be incurred in activities that are identified as overhead activities in Table 3-1.

In accordance with the marginal cost approach of calculating overhead, the overhead rate for each commercial activity will be calculated by dividing the *change* in base overhead costs that result from outsourcing the MEO ($\Delta$OHC) by the direct labor costs of the MEO ($DLC_{MEO}$). The general formula that will be used to calculate the overhead rates associated with each commercial activity is:

$$OHR = \Delta OHC / DLC_{MEO}$$

where OHR = the overhead rate to be associated with the MEO being considered for outsourcing, $\Delta$OHC = the change in total overhead costs for the base that will result if the activity is outsourced, and $DLC_{MEO}$ = the direct labor costs for the MEO being outsourced.

This formula is valid for any number of competitions being conducted simultaneously. If several competitions are being conducted simultaneously, $\Delta$OHC = the change in total overhead costs for the base that will result if all activities are outsourced, and $DLC_{MEO}$ = the sum of direct labor costs for all MEOs being outsourced.

### 3.1.2 Inherently Governmental vs. Commercial Activities

As discussed in section 1.1, a commercial activity is one which is operated by a Federal executive agency and which provides a product or service that could be obtained from a commercial source, and an inherently governmental function is one which is "so intimately related to the public interest as to mandate performance by Government employees. These functions include those activities that require either the exercise of discretion in applying Government authority or the making of value judgments in making decisions for the Government." (OMB 1992, paragraph 5) Examples given of non-inherently governmental activities include building security; mail operations; operation of cafeterias; housekeeping;

facilities operations and maintenance, warehouse operations, motor vehicle fleet management and operations, or other routine electrical or mechanical services.

These definitions and examples indicate that some of each type of activity (i.e., M, A, B, and C) are commercial while others are inherently governmental. Table 3-2 illustrates this point.[1] Appendix C lists all organizations on the case-study Air Force base (i.e., Travis AFB), classifies each as M, A, B, C, or T, and identifies them as commercial or inherently governmental activities.

**Table 3-2 – Examples of Inherently Governmental and Commercial Activities, Classified for OHR Calculation**

| Type of Unit | Commercial Activity | Inherently Governmental |
|---|---|---|
| Mission/Mission Support Units (M) | - Aircraft Maintenance<br>- Transport | - Wing Plans<br>- Treaty Compliance |
| Military Support Units (A) | - Base Housing<br>- Base Hospital | - Military Personnel Flight<br>- Airman Leadership School |
| Support Units (Mil & Civ) (B) | - Transportation Squadron<br>- Fitness Center | - Contracting Flight<br>- Financial Services Flight |
| Civilian Support Units (C) | -------- | - Civilian Personnel Office |

## 3.2 Applying the Generic Framework to a Case-Study Base

### 3.2.1 Applicability of a Case Study Approach

In order to effectively evaluate the validity of the 12 percent rule, it is not only necessary to estimate the OHR for each CA on the case-study base, but also to understand how OHRs are affected by variables such as MEO size and base population, and why OHRs behave as they do.

[1] There are no "C" activities identified as commercial. Conceptually, there is no reason that C activities cannot be commercial. In fact, throughout the non-DoD government, the differentiation of support activities into A, B, and C activities doesn't make sense because, outside of DoD, there are no military personnel to serve. The reason no C activities have been identified as commercial is because all commercial activities on an Air Force base available to civilians are also available to military personnel (i.e., they are B activities). If, however, there were a "Civilian's Club" (similar to Officer and Enlisted Clubs) open only to civilians, it would be an example of a C activity that is a commercial activity.

Without knowing the answers to these questions, a thorough evaluation of the 12 percent rule cannot be performed. In addition, almost all evaluations have to take context into account if the ability to generalize is an issue. (GAO 1990b, 20) Because it is possible that variables peculiar to an Air Force base could affect OHRs, estimating OHRs in the context of an Air Force base is important.

The case study strategy has a distinct advantage over alternative strategies when "how" and "why" questions are being asked about contemporary events over which the investigator has no control (Yin 1994, 9), and "when the phenomenon under study is not readily distinguishable from its context." (Yin 1993, 3). The GAO defines a case study as "a method for learning about a complex instance,[2] based on a comprehensive understanding of that instance obtained by extensive description and analysis of that instance taken as a whole and in its context." (GAO 1990a, 15)

For the "how" and "why" questions this research investigated, a case study strategy was most appropriate because an explanation for the overall pattern of OHR behavior was sought. The data collection necessary to acquire a comprehensive understanding of the complex interactions between the many manning and budget processes and their effects on OHRs had to probe deeply beyond the boundaries of a sample survey or a statistical analysis.

Whereas performing this study on several bases to ensure consistency in the results would have been preferable, the time and resources available did not permit this. However, since it is not expected that OHRs will differ greatly from base to base,[3] it was not necessary to use a multiple-case design. (GAO 1991a, 46)

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[2] "A complex instance" means that input and output cannot be readily or very accurately related. There are several reasons why such a relationship might be difficult. There could be many influences on what is happening and these influences could interact in nonlinear ways such that a unit of change in the input can be associated with quite different changes in the output, sometimes increasing it, sometimes decreasing it, and sometimes having no discernible effect. (p.16) The "input" in this research is the CA being outsourced, the "output" is the OHR.

[3] As will be explained later in this chapter, the methodology used to estimate changes in overhead costs is primarily based on Air Force Manpower Standards (AFMS). Since AFMSs are the same for all Air Force bases, it is not expected that OHRs will differ greatly from base to base.

### 3.2.2 Selecting the Case-Study Base

Travis Air Force Base (AFB) was selected as the case-study base to apply the generic framework described above. The main criteria used in the selection process were: (1) it was scheduled to perform a number of A-76 competitions in the next few years, (2) it had recently conducted at least one A-76 competition and had outsourced at least one function, (3) it still performs a fair number of CAs in-house, (4) it is as representative an Air Force base as possible, and (5) it is a medium-to-large sized base.

The first criterion was desirable to make the study relevant, at least to the case study base, and to prevent causing unwarranted alarm among base employees during the data collection process. The second criterion was desirable because it ensured the base had experience with the A-76 process and post-competition behavior of contractors. The third criterion was necessary in order to calculate the overhead rates for as many commercial activities as possible. The fourth criterion was necessary to make this study's results as applicable to other bases as possible. Travis AFB is reasonably representative of an Air Force base because it performs a flying mission, has percentages of officer, enlisted, and civilian personnel close to the average[4] (see Table 3-3), and provides base support services typical of most Air Force bases. The fifth criterion was desirable because the potential errors from outsourcing competitions are more costly than with a smaller base and, therefore, the potential savings are greater.[5]

[4] An analysis of all Air Force bases with populations greater than 1,000 personnel was performed. The source for base populations was the Consolidated Manpower Database (CMDB), current as of September 1998. Table 3-3 summarizes the results. The percentages of officers and enlisted on Travis AFB are close to the averages. While the percentage of civilians isn't as close to the average as desired, the number of civilians is large and similar to the average. In addition, changes in support activity (A, B, and C) and base common costs are sensitive to the number of civilians on base, not the percentage of civilian personnel.

[5] Because contracts for larger bases will probably cost more than contracts for smaller bases, an error in the OHC estimating rate will produce larger errors in the absolute dollar estimate of OHC. Since the results of this study will be applicable in future A-76 competitions, at least to the case-study base, selecting a medium-to-large sized base would prevent larger errors in OHC estimation than at smaller bases.

### 3.2.3 Composition of MEO

For the purposes of this research, all MEO personnel were assumed to be civilians. Circular A-76 directed DOD to develop a separate overhead rate for military personnel included in the MEO. However, until recently, DOD officials that manage commercial activity programs had no plans to develop such a rate since, by definition,

**Table 3-3 – Travis AFB Personnel Statistics**

| Measure | Travis Rank (out of 71 bases) | Travis | Average | Range | |
|---|---|---|---|---|---|
| | | | | Low | High |
| Number of Officers | 10 | 1,289 | 761.2 | 2 | 3,135 |
| Number of Enlisted | 3 | 6,046 | 3,060 | 7 | 6,527 |
| Number of Civilians | 19 | 1,707 | 1,935.6 | 68 | 12,106 |
| Percent of Officers | 24 | 14 | 13.4 | 0.18 | 47.37 |
| Percent of Enlisted | 32 | 67 | 60 | 0.7 | 82.66 |
| Percent of Civilians | 43 | 19 | 30.6 | 2.69 | 99.1 |
| Modified Grand Total* | 11 | 9,042 | 5,756.7 | 1,003 | 18,473 |
| Grand Total* | 6 | 12,935 | 6,770.6 | 2,133 | 21,800 |

*The Grand Total includes reservists. The Modified Grand Total doesn't.

commercial activities under the A-76 program should not include any military-essential functions. They assumed that when an MEO was developed for an A-76 competition, all military personnel currently working in the activity would be reassigned and the activity would be staffed entirely by civilians. Consequently, no overhead costs for military personnel would have been incurred.[6] In 1998 the Air Force altered its policy to allow a minimum number of military personnel to be members of an MEO if it is cost effective. To date, however, no MEOs with any military personnel have won an A-76 competition.

[6] *Defense Outsourcing: Better Data Needed to Support Overhead Rates for A-76 Studies*, GAO, February 1998, p. 3.

### 3.2.4 Data Collected, Sources, and Collection Procedures

#### 3.2.4.1 Air Force Manpower Standards (AFMS)[7]

This study assumes that support organizations will be authorized manpower according to AFMS guidelines. Base Manpower Offices AF-wide are directed by their MAJCOM's XPM (i.e., Manpower and Organization Directorate) to reapply the AFMSs to base functions every year to determine the number of authorizations that each organization is entitled. If the current number of authorizations[8] in an organization is larger than the new entitlement, the appropriate number of authorizations will be eliminated. If the current number of authorizations is less than the new entitlement, the appropriate number of authorizations will be added.

The AFMSs were obtained from the Travis AFB Manpower and Quality Office. These were used to calculate changes in personnel requirements that would result from an A-76 competition, as well as minimum manning (i.e., "open the door" manning) for each support organization. The specific AFMSs used in the model (i.e., all AFMSs that use base civilian and/or contract manpower equivalent [CME] populations to determine manpower requirements) are listed in Appendix A.

#### 3.2.4.2 Authorized Military Manning and Associated DLC

Authorized military manning was obtained for each CA and support organization from the Unit Manning Document (UMD),[9] current as of 1 Apr 99. The annual DLC for each military

[7] An Air Force Manpower Standard (AFMS) is an Air Force document that describes how the manpower requirements for a specific function at Air Force bases are determined. Each function has an AFMS that is used at every base Air Force-wide. The standards are developed jointly between the manpower and functional community and are approved by the Air Staff. There are approximately 185 AFMSs.

[8] Authorizations and personnel are not synonymous. Authorizations are funded positions, or "spaces." Personnel refers to the actual people who fill the authorizations, or "faces." For a number of reasons (e.g., shortage of a particular specialty Air Force-wide, replacement personnel not arrived yet), not all authorizations will be filled.

[9] The UMD identifies all military and civilian authorizations in each organization on an Air Force base. Military authorizations are identified by rank. Civilian authorizations are only identified as existing; no grade is provided.

authorization was obtained from the Military Standard Composite Accelerated Rates Table in AFI 65-503, Table A32-2, effective 29 Apr 99.

The peacetime Military Man-hour Availability Factor (M-MAF) of 163.2 hours per month was provided by the Travis AFB Manpower and Quality Office, but was calculated by what is now the Air Force Center for Quality and Management Innovation.[10]

This data was used to calculate the CA's current DLCs and to calculate changes in DLCs that would result from outsourcing a CA.

### 3.2.4.3 Authorized Civilian Manning and Associated DLC

Authorized civilian manning was obtained from the civilian Unit Personnel Management Roster (UPMR),[11] current as of 9 Mar 99. The annual salary for each civilian authorization was either obtained from the 1999 General Schedule Locality Rates Table for the San Francisco-Oakland-San Jose, CA area or calculated from the Federal Wage Rate Schedules for San Francisco, CA (i.e., hourly wages were converted to annual salaries by multiplying by 2,087 as directed by the A-76 Supplemental Handbook). All General Schedule (GS) authorizations were assumed to be step 5 and all Federal Wage Service (FWS) authorizations were assumed to be step 4, also as directed by the A-76 Supplemental Handbook. The annual DLC for each civilian authorization was calculated by applying a 32.85 percent standard factor to the annual civilian salaries to include all benefits (e.g., retirement, insurance, health benefits) civilians receive. The 32.85 percent standard factor was obtained from the COMPARE software program.[12]

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[10] The Man-Hour Availability Factor (MAF) is a planning tool used by the Air Force to determine how much time an assigned individual is available to perform their primary duty and is expressed in man-hours per month. The MAF is a common conversion factor when working with AFMSs to convert man-hours into manpower requirements. The Air Force Center for Quality and Management Innovation (AFCQMI), located at Randolph AFB, TX, is a Field Operating Agency (FOA) of the Directorate of Manpower and Organization (AF/XPM), HQ USAF. It was the Air Force Management Engineering Agency (AFMEA) when they calculated the M-MAF and C-MAF.

[11] Whereas the rank identified for military authorizations in the UMD could be used to calculate DLCs, this was not possible for civilian authorizations. The UMPR lists the individuals currently filling all authorizations on Travis AFB, military and civilian, along with their ranks/grades. For civilians, the grade of the individual currently filling the authorized position was used to calculate DLCs.

[12] COMPARE is a software program designed to automate the cost comparison calculations and produce required reports used to determine whether the MEO or a contractor should perform a commercial activity. It is distributed and supported by the Air Force Center for Quality and Management Innovation (AFCQMI).

The peacetime Civilian Man-hour Availability Factor (C-MAF) of 147 hours per month was provided by the Travis AFB Manpower and Quality Office, but was calculated by what is now the Air Force Center for Quality and Management Innovation.

This data was used to calculate the CA's current DLCs and to calculate changes in DLCs that would result from outsourcing a CA.

#### 3.2.4.4 Budget Data and Behavior

General budget information was provided by the Financial Analysis Flight in the Comptroller Squadron. This included budget data, current and past, for organizations on base, as well as information about the budget process.

Information about budget requirements unique to each organization came from interviews with knowledgeable people in the organization. Interviews were conducted face-to-face by the researcher and were set up in advance. Interviewees were informed of the topic and type of information that would be solicited when the appointment was made. All interviews except one started with either the commander or deputy commander of the organization. These people usually held the rank of Colonel, Lieutenant Colonel, or Major, or the civilian equivalent (e.g., GS-13 or GS-14). Frequently, the unit budget officer was also in the meeting. In the one exception, the CMSgt of the unit was interviewed.[13] For questions the interviewee(s) couldn't authoritatively answer, either a person more knowledgeable about the specific operational details was called into the interview or the researcher was referred to them.

The interview generally followed the questionnaire in Appendix E and was administered orally by the researcher.[14] The purpose of the interview was to determine how the organization's budget requirements would change if base activities were outsourced. It did this by trying to answer three questions:

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[13] In the case of the Security Forces Squadron, the CMSgt was probably as knowledgeable as any other person in the Squadron about security force procedures and requirements. The squadron had a Lt Col as commander, a Captain, and a First Lieutenant.

[14] Although the interview used a data collection instrument to collect data (i.e., the questionnaire), the GAO (p. 10) would refer to it as an unstructured interview because each interviewee was not offered the same set of possible responses. The intent was not to "cubby hole" responses, but to acquire an understanding of their budget requirements and how those requirements are affected by changes in workload and base populations.

(1) What activities, people, and organizations drive the support organization's workload?

(2) How do budget requirements change with a change in workload? and

(3) How is workload affected by the base's civilian and contractor population?

Data on the cost of utilities (i.e., water, sewage, electricity) came from the Civil Engineering Squadron. The standard quantity of water and sewage used per person was obtained from AFI 32-1061, "Providing Utilities to US Air Force Installations." Electricity usage for cubicle items (e.g., PCs, desk lamps, printers, answering machines) was provided by the Civil Engineering Squadron.

This data was used to construct the budget functions used to estimate changes in budget requirements that would result from outsourcing a CA.

#### 3.2.4.5 CAs on Travis AFB

The list of commercial activities for the base was developed using the Commercial Activities Management Information System (CAMIS) database; Appendix A of Circular A-76, *Examples of Commercial Activities*; through interviews with knowledgeable people on base; and whether a similar service is currently being provided in the private sector. CAs were selected without regard to legal issues (e.g., security forces and fire protection services were considered to be CAs even though there are currently Congressional mandates prohibiting the Air Force from outsourcing them), mobility requirements, or probability of the Air Force competing it. With the current policy environment encouraging as much outsourcing as is economically feasible, the purpose was to estimate the overhead costs that would be eliminated if the Air Force outsourced everything other than inherently governmental functions. Appendix B contains a list of CAs used in this study.

#### 3.2.4.6 Support Organizations on Travis AFB

Support organizations were identified from organization charts obtained from each wing and group on base, the Travis AFB phone book, and interviews with knowledgeable people on base.

A list of all organizations on Travis AFB, identified as M (mission), A (military only), C (civilian only), or B (both military and civilian), is in Appendix C. All B and C organizations are authorized manpower based on the civilian and/or CME populations on base. Only these organizations (i.e., B and C organizations) are included in the model. Appendix A contains a list of these organizations and their AFMSs.

3.2.4.7 Work Years Expended By Precompetitive Government Organizations Performing CAs, and the Work Years Saved by MEOs

These two figures were obtained from the Commercial Activities Management Information System (CAMIS) database for all A-76 competitions initiated and completed between FY94 and the first quarter of FY99, inclusive. This data was used to estimate a Work-Year Transformation Rate (WkYr TR) to apply to precompetitive CAs on Travis AFB to estimate the size of potential MEOs. The formula to compute the work-year transformation rate for each competition was:

WkYr TR = 1 – (# wrk yrs saved by MEO / # wrk yrs expended by precompetitive organization).

The number of work years saved by the MEO is in field 28b of the CAMIS database. The number of work years expended by the precompetitive organization is in field C24 of the database. The work-year transformation rates for all competitions were then averaged to obtain the WkYr TR that would be applied to precompetitive CAs on Travis AFB to estimate the size of potential MEOs. The average WkYr TR was 73.8 percent, which was rounded to 75 percent (.75) for use in the model. As will be discussed later, since fractional manpower authorizations are rounded up (e.g., 5.1 authorizations is rounded up to 6 authorizations), the rounding of the WkYr TR up to .75 will not affect the results at all in the vast majority of cases. In the rare case that the rounding does affect the results, the effect will be that the actual OHR will be lower than the OHR calculated and presented in this study. If actual OHRs are lower than those presented, this study's conclusions will not change.

Although the default WkYr TR when reporting results in this paper is .75, sensitivity analyses were performed to give the reader an idea of how sensitive the results are to this assumption.

### 3.2.4.8 DLC of Precompetitive Government Organizations Performing CAs and MEOs

The DLC of all MEOs are in field C1 of the CAMIS database. However, the CAMIS database doesn't contain the DLC of the precompetitive government organizations performing CAs. To estimate the DLC transformation rate (DLC TR) to use in the model in the limited time available to the researcher, a random sample of Air Force bases initiating and completing A-76 competitions between FY94 and the first quarter of FY99, inclusive, was chosen.[15] Requests were made to the bases that conducted the competitions for the precompetitive DLCs of all competitions conducted at the selected bases during the 5.25 year time interval. Twenty of 35 CONUS bases, accounting for 35 of 52 relevant competitions[16] were queried for precompetitive organization DLCs. Data for 25 of the 35 requested competitions was supplied to the researcher. The individual bases obtained the precompetitive DLC, or the precompetitive organization's manning authorizations, from the management study that was performed to design the MEO. If manning authorizations were supplied, current DLC were calculated on the organization and then were multiplied by the appropriate year's deflator, which was obtained from the USAF Raw Inflation Indices published by SAF/FMCEE and current as of 15 Jan 99.

This data was used to estimate a DLC Transformation Rate (DLC TR) to apply to precompetitive CAs on Travis AFB. The formula to compute the DLC transformation rate for each competition was:

$$\text{DLC TR} = \text{DLC of MEO} / \text{DLC of precompetitive organization.}$$

[15] This is not the same as a random sample of A-76 competitions. Some bases conducted multiple competitions in the time interval while others conducted only one.

[16] There was a total of 63 A-76 competitions initiated and completed during the time interval. There was one competition which covered multiple installations. Two others were enlargements of responsibility, resulting in larger MEOs than precompetitive organizations. And eight of the remaining competitions were for five non-CONUS bases (two in Germany, one in Guam, and two in Alaska). None of these competitions were included in the population from which the random sample was selected. Multiple installation competitions and enlargements were not included because they are not consistent with the spirit of this research, and non-CONUS bases weren't included because it was not known if there were special circumstances peculiar to them (e.g., host country agreements, considerations for native peoples) that were not applicable to Travis AFB.

The DLC transformation rates for all competitions were then averaged to obtain the DLC TR that would be applied to precompetitive CAs on Travis AFB to estimate the potential MEOs' DLC. The average DLC TR was 73.4 percent, which was rounded to 75 percent (.75) for use in the model. Although there is a relationship between the average reduction in work years from precompetitive organizations to MEOs and the average reduction in direct labor costs from precompetitive organizations to MEOs and, therefore, it might be expected that the WkYr TR and the DLC TR would be similar, the degree of their similarity is coincidental.

Although all results reported in this paper assume a DLC TR of .75, the analytical integrity of the results are not dependent on this assumption. Since the only use of the DLC TR is to estimate the MEO's DLC, which is the denominator of the overhead rate equation, the results reported in this paper can be adjusted to those of an alternate DLC TR by multiplying the results by .75/x, where x is the preferred transformation rate.[17]

## 3.3 The Model

The purpose of the model was to accurately estimate the overhead savings that would result from one or more CAs being outsourced. It was implemented in Microsoft Excel 97 on a PC compatible and requires approximately 1.5 megabytes of storage.

The overall approach taken by the model was to calculate for each support unit on base the expected changes in DLC and requested (non-labor) budgets that would result from outsourcing one or more CAs. The model took a long-run approach; that is, it predicted the difference between base overhead costs today and what base overhead costs would be several years in the future[18] if no other changes occurred on base. For example, it didn't consider one-time changes in base overhead due to outsourcing (e.g., costs of severance activities) and, when new employees were hired as a result of the competition, they were assumed to hold the journeyman

[17] $OHR = \Delta OHC / DLC_{MEO} = \Delta OHC / (DLC_{PreComp} * .75) \Longrightarrow OHR' = [\Delta OHC / (DLC_{PreComp} * .75)] * .75 / x = [\Delta OHC / (DLC_{PreComp} * x)]$

[18] The long-run approach is implemented by using Air Force-wide AFMS rules to estimate support manpower after CAs are outsourced. (see section 3.2.4.1) In addition, due to Government employment policies (e.g., retreat rights, bumping), it is possible for a worker displaced as a result of an A-76 competition to acquire another position on base authorized for a lower pay grade than he, and maintain his current salary. When this happens, base costs will not be reduced as much as expected. However, these effects should disappear in time.

pay grade even though they might not be hired at that grade. The procedures used to calculate overhead cost changes are described below and a high level, general approach is illustrated in the flowchart in Figure 3-2. More detailed flowcharts are in Appendix E. In addition, a lengthy, but thorough illustrative example is presented in Appendix G. After estimating the DLC and budget changes for each support unit, they were summed to estimate the total change (i.e., savings) in overhead costs for the base that would result from outsourcing the CA.

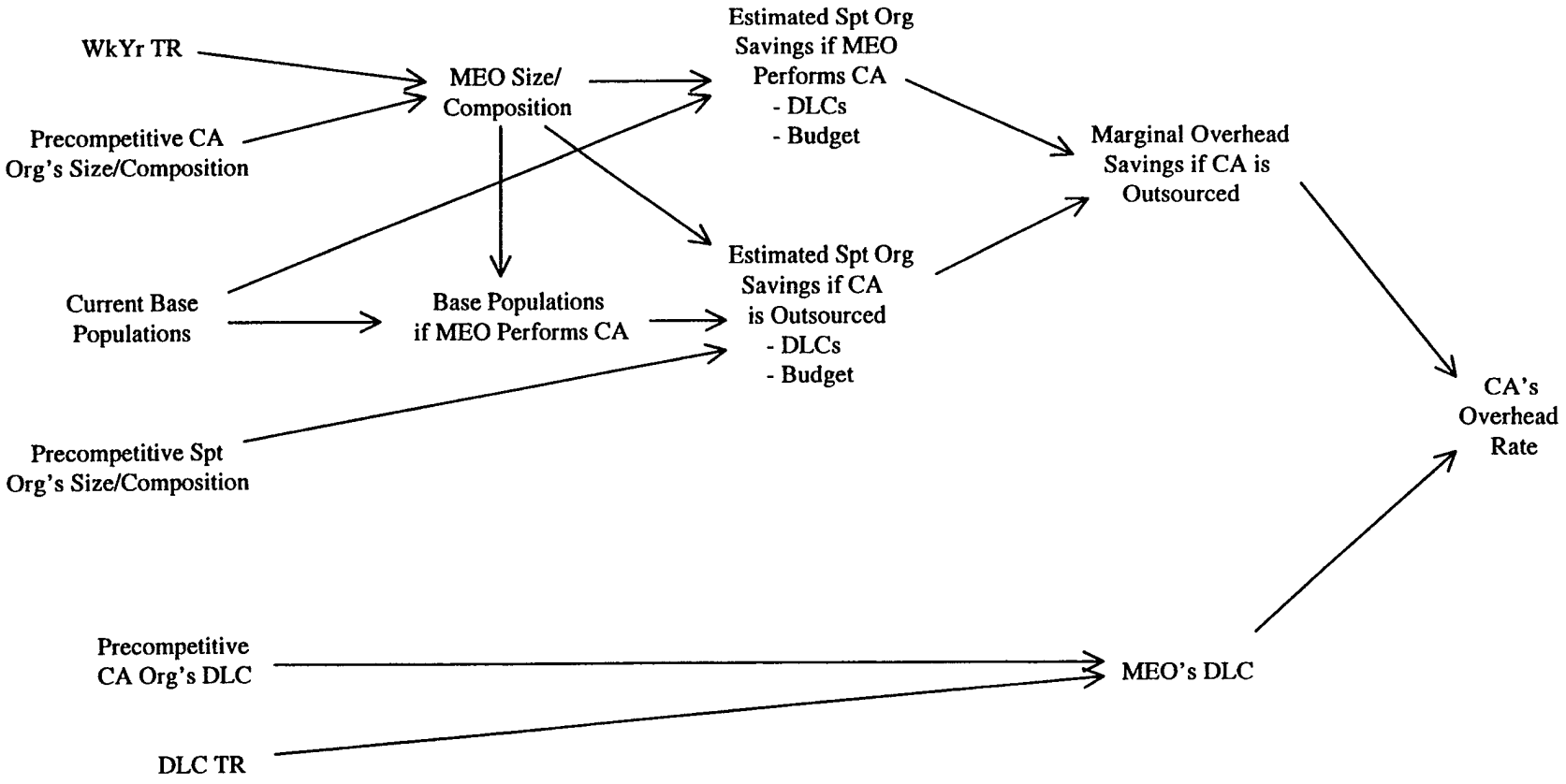
The model assumed all CAs outsourced remained on base, taking over the facilities used by the current organization. This is a reasonable assumption because (1) this was the case with all previously outsourced organizations, and (2) many of the CAs (e.g., aircraft maintenance, aerial port, fire protection, medical services) are so integrally related to supporting the mission or personnel performing the mission that removing them from the base, or close proximity thereof, could adversely affect readiness or mission performance.

The model doesn't differentiate between multiple A-76 competitions being performed simultaneously. For example, if Travis AFB were conducting two independent competitions (i.e., two MEOs) simultaneously, one for the Fuels Management Flight in the Supply Squadron involving one officer, 82 enlisted, and 9 civilians, and another for the Fitness Center in the Services Squadron involving 12 enlisted, and 2 civilians, the model will treat this the same as if it were one competition involving one officer, 82 enlisted, and 9 civilians from the Fuels Management Flight, and 12 enlisted and 2 civilians from the Fitness Center (i.e., one MEO involving authorizations in two organizations). Because of this lack of differentiation the term "CA" (i.e., singular) will, henceforth, be used regardless of the number of functions being competed or independent competitions being conducted.

### 3.3.1 Estimating Changes in Support Unit DLCs as a Result of Outsourcing

Following the generic example described in section 3.1, all units on base were identified and categorized as mission (M), military support (A), general support (B), civilian support (C), or tenant (T) to determine the support organizations whose DLCs would be affected by outsourcing a CA. For all support organizations identified as B or C, the Air Force Manpower Standard

# Figure 3-2 - Flowchart of General Approach



(AFMS) was examined. If an organization had an AFMS workload factor (i.e., an "X" in its AFMS equation) that includes the base's DoD civilian population or contract manpower equivalents (CME), the organization was included in the model. Appendix A has a list of these organizations (i.e., the organizations included in the model) and their AFMS equations.[19] Organizations that are authorized manning without regard to DoD civilian or CME populations were not included in the model (i.e., organizations with AFMS workload factors that were affected only by the military personnel population or quantities of inanimate objects [e.g., aircraft, media outlets] were not included in the model).

For each support organization included in this part of the model, its DLCs are estimated assuming the CA is performed by the MEO, and again assuming the CA is outsourced. The expected change in DLC due to outsourcing was estimated by calculating the difference between these figures (i.e., ΔDLC due to outsourcing = DLC if CA is performed by MEO – DLC if CA is outsourced). Deriving this estimate was a four-step process: (1) calculate the current DLC of the support unit (i.e., when the CA is being performed by a precompetitive Government organization), (2) estimate the support unit's DLC if the CA were performed by the MEO, (3) estimate the unit's DLC if the CA were outsourced, and (4) calculate the difference between the unit's DLC if the CA were performed by the MEO and its DLC if the CA were outsourced (i.e., the difference between the figures obtained in steps 2 and 3).

### 3.3.2 Calculating the Support Unit's Current DLC

For each support unit included in the model, its current DLC is calculated based on the organization's current manpower authorizations. Authorizations (i.e., funded positions) were used throughout the modeling process to calculate DLC and overhead savings. Authorizations better represent long-run DLC than "required" positions (as calculated using the AFMS equation) or the specific people currently filling authorized positions. Authorizations more accurately

[19] Some AFMSs determine organization manning using one or more tables rather than an equation. Only one example of an AFMS's manpower table is provided. The Manpower and Quality Office's AFMS manpower table (Table A-2 in Appendix A) is one of the least complex and is provided as an example to convey the size and complexity of many of the tables. The remaining tables are not included in Appendix A. If the reader is interested in seeing other manpower tables, all 185 AFMSs, including manhour/manpower equations and tables, can be found on the AFCQMI web site: http://www.afcqmi.randolph.af.mil

indicate long-run Air Force spending than AFMS requirements, and promotions, retirements, reorganizations, and personnel transfers (i.e., permanent change of station [PCS], permanent change of assignment [PCA]) make the specific people currently filling authorized positions quite transitory. For example, a unit commander may choose to put a Technical Sergeant (TSgt) in a position authorized for a Master Sergeant (MSgt) in anticipation of a promotion, or leave a Senior Master Sergeant (SMSgt) who was assigned the position before being promoted, but the MSgt authorization will generally be there from year to year. A support organization's current DLC is calculated by summing the DLC incurred for each authorization in the current (i.e., precompetitive) organization.

In addition to calculating the organization's current DLC, the precompetitive manning percentage (i.e., the number of authorized manpower positions divided by the AFMS "required" manpower positions) of the support unit was calculated. This percentage was used later when estimating the support organization's manpower authorizations if the CA were performed by the MEO, and again when estimating the authorizations if the CA were outsourced. Manning the support organization at the same percentage of required manning is based on the concept that A-76 competitions are not supposed to be performed in order to allow either the MEO or support organizations to "get well." That is to say, if a current CA is undermanned to the point where it can no longer perform its functions to the level intended by the AFMS, an A-76 competition should not be conducted to construct an MEO that is larger than the current organization, thereby regaining its capabilities. Applying this concept to support organizations, if a support organization is currently undermanned according to its AFMS equation (i.e., based on current base population), outsourcing a CA (i.e., decreasing base population) will make the support organization stronger if its manning remains constant. Whereas Air Mobility Command says it is not current policy to harvest the gains in strength from all support organizations until they are manned at the same percent level as they were prior to the competition, it does admit its policy is to consider organizations that gain strength as high visibility for future manning cuts. Since the intent was to take the long-run approach to estimating overhead savings and the Travis Manpower Office felt confident that these support organizations would lose the authorizations in

the few years following the competition, the model mans support organizations at their precompetitive manning percentages.[20]

### 3.3.3 Estimating the Support Unit's DLC If the CA Is Performed By the MEO

#### 3.3.3.1 Treatment of MEO and Base Populations

Since the 12 percent overhead estimating rule is applied to the MEO's DLC, not the precompetitive organization's, the model must "construct" an MEO and modify the base population accordingly before it is able to estimate the support unit's DLC if the CA were performed by the MEO. Based on data collected from the CAMIS database, the model assumes the MEO will have 25 percent fewer employees than the precompetitive organization. The 25 percent reduction in size is based on the average percent reduction in work-years expended between precompetitive organizations and MEOs for A-76 competitions initiated and completed between FY94 and the first quarter of FY99, inclusive. This was computed using data from the CAMIS database. (See section 3.2.4.7 for a more detailed explanation of how the 25 percent reduction in size was determined.) The model implemented the 25 percent reduction through the use of a work-year transformation rate (WkYr TR). That is, the precompetitive organization was transformed into the MEO by multiplying the precompetitive organization's authorizations by the WkYr TR, which is equal to (1 – the work year reduction rate). Consequently, a 25 percent work year reduction rate is equal to a WkYr TR of 75 percent.

In addition, the model assumed the MEO's DLC to be 25 percent lower than the precompetitive organization's. This reduction in DLC is based on the average percent reduction in personnel costs between precompetitive organizations and MEOs for a sample of past A-76 competitions. (See section 3.2.4.8 for a more detailed explanation of how the 25 percent reduction in DLC was determined.) The model implements the 25 percent reduction through the use of a DLC transformation rate (DLC TR). That is, the precompetitive organization's DLC is

[20] Since this research is based on a case-study of Travis AFB, no effort was made to contact other MAJCOMs to determine if their policies are similar to AMC's. Regardless of how widespread this policy is, using precompetitive manning percentages did not significantly affect results. In addition, the automated model can easily be modified in minutes by anyone knowledgeable about the model to make it applicable to other policies.

transformed into the MEO's by multiplying the precompetitive organization's DLC by the DLC TR, which is equal to (1 – the DLC reduction rate). Consequently, a 25 percent DLC reduction rate is equal to a DLC TR of 75 percent.

The significance of the WkYr TR is that it determines the size of the MEO and, consequently, the amount the base's civilian and CME populations (i.e., the workload factors in the AFMS equations) change from MEO performance of the CA to outsourcing it. The difference in base population between in-house performance of the CA and outsourcing it affects the probability that the size and, therefore, the DLC of support organizations will change. Consequently, the smaller the WkYr TR (i.e., the larger the man-year reduction rate), the lower the expected reduction in base overhead costs due to outsourcing. Conversely, the larger the WkYr TR (i.e., the smaller the man-year reduction rate), the larger the expected reduction in base overhead costs due to outsourcing. Although the default WkYr TR when reporting results in this paper is .75, sensitivity analyses were performed to determine how sensitive the results are to this assumption.

The significance of the DLC TR is that it determines the DLC of the MEO and, therefore, the denominator in the overhead rate calculating formula (i.e., $OHR = \Delta OHC / DLC_{MEO}$). Beyond its use in the model (i.e., calculating the overhead rate for the CA), it also affects the estimate of overhead costs that will be included in the government bid. The smaller the DLC TR (i.e., the larger the DLC reduction rate), the lower the Government bid. This is because both the estimate of personnel costs and, in turn, the estimate of overhead costs (i.e., 12 percent of personnel costs) will be lower. Conversely, the larger the DLC TR (i.e., the smaller the DLC reduction rate), the higher the Government bid.

In addition to reducing the size of the precompetitive organization to form the MEO, the model eliminates all military authorizations in the precompetitive organization and adjusts the number of civilians to the estimated size of the MEO. This is because of the assumption that all MEOs will be 100 percent civilian. These changes in MEO population and composition were also reflected in the base's and relevant squadron's civilian and military populations for the purpose of determining support organization manning.

### 3.3.3.2 Treatment of Support Organization

Based on the modified military and civilian populations on base after the MEO is formed, the model uses the AFMS equation to calculate the required manning for the support organization. As is the practice in Manpower Offices, fractions of required manning are rounded up to the nearest whole person. Given the new AFMS required manning, the new number of authorizations is estimated by multiplying the new number of required positions by the precompetitive manning percentage. Again, fractions of authorizations are rounded up. If the new number of support organization authorizations is smaller than the current number, authorizations were eliminated causing a reduction in DLC for the support organization.

Because new civilian authorizations are generally harder to get than new military authorizations, base manpower offices prefer to retain civilian authorizations and eliminate military authorizations when manpower authorizations are reduced due to a shrinking base population.[21] Consequently, if outsourcing a CA causes the support organization to lose a manning authorization the model assumes a military position is eliminated, specifically, an enlisted position. Rather than selecting a specific enlisted position to eliminate and reducing the DLC incurred by that position, the model reduces DLC by the weighted average DLC of an enlisted authorization in that unit. Generally, the weighted average will be greater than the DLC incurred by the authorization that would be eliminated in reality. However, as the size of an organization shrinks the rank structure is generally reduced as well, so overestimating the DLC incurred by the eliminated position also accounts for the reduced DLC incurred by the remaining authorizations. If more authorizations are eliminated than the number of enlisted authorizations in the organization, officer authorizations are eliminated, also estimated by the weighted average DLC of an officer's authorization in that unit. This algorithm was suggested by Manpower and

[21] This is in contrast to command HQ who would prefer to retain military authorizations and eliminate civilian authorizations whenever possible. This is because labor costs for civilians is either 3400 or TWCF money which comes out of the command's budget, while labor costs for military personnel is 3500 money, which is a centrally managed allotment controlled by HQ USAF. Operations and maintenance appropriations (3400) finance the day-to-day activities for operating commands and bases. Its purposes are to operate and maintain Air Force resources such as aircraft, missiles, radar, and base facilities, as well as to provide communications, training, civilian pay, contractual services, supplies, and aircraft fuel. Transportation Working Capital Funds (TWCF) reimburse other government organizations for providing transportation services (e.g., airlift and traffic management services). Military personnel appropriations (3500) finance military pay and allowances for active duty personnel (it doesn't include Air Force Reserve or Air National Guard personnel costs).

Quality Office personnel as the most accurate representation of what would happen in reality. However, the model also performs sensitivity analyses on the assumptions of (1) retaining civilians, and (2) eliminating the weighted average DLC of an enlisted authorization. The sensitivity analyses conducted are described in the "Sensitivity Analysis" section, below, and demonstrated in the illustrative example in Appendix G.

Realizing that some organizations cannot operate without a minimum number of people (e.g., Group Commander's Office, Finance, Aerial Port) and that the assumption of retaining civilians could lead to organizations that couldn't meet their mobility requirements, the model assumed a minimum number of total authorizations and a minimum number of military authorizations for each organization just for "opening the door." The minimum number of total authorizations was obtained from the manning table in the support organization's AFMS. The minimum number of military authorizations was provided by the Manpower and Quality Office after careful consideration. The figures provided by the Manpower Office are unique to Travis AFB, but the concept is applicable to most Air Force bases. Minimum military manning figures could take the form of a number (e.g., 3 military personnel) or a percentage (e.g., 70 percent of the organization's population). So, as base population falls due to MEO construction and outsourcing, manpower authorizations for each support organization falls, as well.[22] As this happens, the model reduces military authorizations as necessary until either the minimum total authorizations or the minimum military authorizations is reached. If the minimum military authorizations is reached but not the minimum total authorizations, further reductions in authorizations come from civilian authorizations. As civilian authorizations are removed, the estimated DLC is reduced by the weighted average DLC of all civilian authorizations (i.e., GS and wage grade). If the number of authorizations falls to the minimum manning point, support organization population is frozen at that level (i.e., it is not reduced any further regardless of how much further base population falls). A sensitivity analysis is also performed on the order in

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[22] The Civilian Personnel Office is a possible exception. Since all military authorizations in the CA are converted to civilian authorizations when MEOs are developed, in many cases the base's civilian population will grow as a result of an A-76 competition which is won in-house. When this happens, it is possible for the Civilian Personnel Office to grow. See section 3.3.8 for a more detailed explanation of this.

which civilian authorizations are eliminated, is described in the "Sensitivity Analysis" section, below, and is illustrated in the example following that.

In the cases that MEO implementation results in a larger civilian population which, in turn, results in a larger Civilian Personnel Office, the authorizations added are assumed to be GS-11s. This is because the journeyman level of employees in the Civilian Personnel Office on Travis AFB is GS-11. This appears to be a reasonable assumption since the Civilian Personnel Office is currently manned with four GS-5s, two GS-7s, eleven GS-11s, two GS-12s, and a GS-13.

At this point, the model's estimate of manpower and DLC changes is based solely on the reduction in base personnel due to the MEO being implemented. However, in the long run, the base population will also be reduced by the number of support authorizations that were eliminated as a result of the MEO being implemented. To account for these additional reductions in support organization manpower and to obtain a more accurate estimate of long-run DLCs, the base populations (military and civilian) are modified to reflect the reductions (or additions in the case of civilians) in support organization authorizations and the process of estimating support organization manning and DLCs as described above is repeated. This process of modifying base populations, recalculating support organization manning, modifying base populations, recalculating support organization manning, etc., is repeated until no additional support organization authorizations are eliminated as a result of the reduction in support organization manpower.

In brief, the relevant result of these estimations in support organization manpower changes is an estimate of each organization's DLC if the CA is performed in-house by the MEO.

### 3.3.4 Estimating the Support Unit's DLC If the CA Is Outsourced

With one exception, the procedures used to estimate support organization manning and DLCs if the CA is outsourced are exactly the same as those described above to estimate manning and DLCs if the CA is performed by the MEO. Instead of estimating a reduction in size of the precompetitive organization to the MEO and adjusting the base populations accordingly, the entire precompetitive organization (military and civilian authorizations) is eliminated from the

base and the CME population is increased by the size of the MEO.[23] Each support organization's manning authorizations and DLCs are then estimated, using the procedures described above, based on the new base populations. Again, the repetitive process of modifying base populations, recalculating support organization manning, modifying base populations, recalculating support organization manning, etc., is repeated until no additional support organization authorizations are eliminated as a result of the reduction in support organization manpower.

The relevant result of these estimations in support organization manpower changes is an estimate of each organization's DLC if the CA is outsourced.

### 3.3.5 Estimating Total DLC Savings Due to the CA Being Outsourced

To determine each support organization's DLC savings that result from outsourcing, the difference between the organization's DLC if the CA is performed by the MEO and its DLC if the CA is outsourced is calculated. The differences for all support organizations are then summed to get the estimate of total DLC savings due to the CA being outsourced.

The DLC incurred by contract administrators and quality assurance personnel employed as a result of the CA being outsourced are not considered in the estimate of DLC savings (i.e., as a reduction in savings) since they are considered to be a direct cost to the contract and are added to the contractor bid when developing the cost of contractor performance.[24]

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[23] AFI 38-203, *Commercial Activities Program* (April 1994), p. 9, states that CMEs are a measure of the number of government employees required to perform the contracted workload at the same level of service specified in the contract, not the number of personnel the contractor uses to perform the activity. Therefore, when an activity is outsourced, the number of CMEs added to the base and maintained on the manpower data system is the equal to the MEO size, or in the case of a direct conversion, the number of authorizations in the outsourced activity. *Air Force Commercial Activities Program Instruction* (July 98), paragraph 12.6.3.2, also states that an MEO FTE is equivalent to a CME. In addition, the objective of this research is to estimate the effects on overhead, which are secondary to the cost difference between MEO and contract performance of the CA. Because effects on overhead per MEO member are fairly small, all that is necessary to obtain reasonably accurate results is that MEO FTEs ≈ CMEs.

[24] See Illustration II-1, The Generic A-76 Cost Comparison Form in the A-76 Supplemental Handbook, line 8, "Contract Administration."

### 3.3.6 Estimating Changes in Support Unit Budget[25] Requests as a Result of Outsourcing

To determine which support organizations' (non-labor) budget requests would be affected by outsourcing a CA, interviews were conducted with each organization whose manning is affected by the base's civilian and CME populations, as well as all other organizations that support civilians (i.e., B and C units).

The original plan was to collect data on each support organization's current budget (i.e., before anything was outsourced), then to subtract an estimate of what the organization's budget would be after the CA was outsourced, as was done with DLC. That approach would have allowed questions to be asked with respect to some starting point (i.e., the organization's current budget) and the interviewee to respond cognizant of the relative magnitude, and hopefully realism, of his answer. However, after collecting and analyzing budget data for the past 3 years (i.e., all that could reasonably be obtained) it was discovered that there was little consistency in many support organization budgets from year to year, and the reason(s) for the fluctuations were not always understood by the interviewees or under their control. Consequently, estimates of future budgets could not reasonably be based on past data.

The approach was then modified to define budget requirements as the budget requested, not the budget received, because the budget request is generally derived from some quasi-systematic rules of thumb based on unit responsibilities and factors under its control (e.g., quantity and composition of resources applied to responsibilities, activity and expenditure scheduling)[26] while the budget received depends on many factors not under the unit's control (e.g., Air Force budget, force modernization requirements, requirements of other units on base, fall-out money). Since the budget received by each organization is usually less than the budget requested, the model will generally overestimate the change that will result in the base's non-labor overhead costs. If this

[25] Throughout this paper, the term "budget" refers to the non-labor budget. The labor portion of the budget is referred to as direct labor costs (DLCs).

[26] The rules of thumb used to request budgets may vary between commanders and, therefore, are not 100 percent replicable. However, since the main cost drivers within an organization (e.g., customers served, travel vouchers processed, computer support) would be the same regardless of the current commander, it is reasonable to assume budget requests would be similar from one commander to the next.

is the case, the estimate of the change in budget will be an upper bound on the non-labor overhead costs actually saved by outsourcing.

If an organization had a budget that was permanently affected[27] by a change in the base's civilian or contractor population, the organization was included in this part of the model. Organizations with budgets not affected by these factors were not included in the model (i.e., organizations with budgets affected only by the military personnel population were not included in the model).

In addition, effects on budget requirements due to a change in mission were not considered. For example, if the Aerial Port Squadron were outsourced but the Transportation Squadron had to continue providing and maintaining vehicles for the contractor-run aerial port, the Transportation Squadron's budget wouldn't be significantly affected. It may lose some personnel due to the smaller base population which, in turn, would reduce its budget requirements for PCs and office supplies. However, if, under the terms of the contract, the contractor were responsible for purchasing, operating, and maintaining the vehicles it uses, the Transportation Squadron's mission would be substantially reduced and, consequently, could reduce its budget requirements substantially. This change in budget requirements would result from a change in the Transportation Squadron's mission, not merely because something was outsourced resulting in a smaller base population. Obviously, if the mission for these support organizations changes, it is very likely that their budget requirements would change. However, for this research, since there was no way to predict how each organization's mission would change as a result of outsourcing, it is assumed that each organization's mission remains constant.[28]

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[27] Since the purpose of the study was to estimate the overhead rate that would be permanently eliminated as a result of the competition, one-time changes in support organization budgets that resulted from outsourcing (i.e., transition costs) were not included in the model. For example, the Family Support Center provides transition assistance to civilians who are displaced as a result of a competition. This requirement would increase the Family Support Center's budget requirements for the year in which the outsourcing occurred, but it would not be a permanent change in costs. Therefore, it is inappropriate to include these costs in overhead, even though they occur in an overhead organization, but rather to consider them when developing the cost of contract performance. See Illustration II-1, The Generic A-76 Cost Comparison Form in the A-76 Supplemental Handbook, line 10, "One-time Conversion."

[28] Support provided to the contractor by the Government is generally considered when writing the PWS. The effect of a support organization mission change (i.e., an elimination of a portion of the support organization's functions) will generally be that the cost of providing the eliminated service is converted from overhead for the base to direct costs for the contract. For example, if the Transportation Squadron no longer provided vehicles and maintenance to the contractor-run aerial port, overhead costs for the base would be reduced because the Transportation Squadron's budget would be reduced, but the cost of vehicles and maintenance would then be borne by the contractor, which means the costs would be embedded in the contract cost. In any case, while most mission change items would be

Once the effects that the base's civilian and contractor populations have on budget requests were known, some function or series of functions were constructed that reflected those effects. In reality, recurring budget items fell into four categories: (1) per capita costs (e.g., water, sewage), (2) items with step functions (i.e., a cost function characterized by ranges of constant costs, or plateaus, followed by a sudden increase or decrease to another plateau) based on base population (e.g., computer help desk, mail sorting machine), (3) items whose cost varies regularly over a span of years (e.g., personal computer [PC] purchases, training), and (4) items with "probabilistic cost functions" (i.e., items whose cost depends on the specific individuals who use the item [e.g., base gym, day care]).

Per capita costs changed approximately the same amount for each civilian added to or removed from the base (e.g., water, sewage). For these costs, reality could be fairly accurately modeled with a linear function.

Items with step functions dependent on base population could generally serve broad ranges of base population for any given level of staffing/funding, but required additional resources when workloads reached a critical level. In other words, capacity is added or removed in large increments and could take the form of personnel or capital. Examples are an additional person manning the computer help desk or an additional mail sorting machine. These costs were modeled as realistically as they could be determined. That is, the critical population values where resources were no longer required, or additional resources were required, were determined as accurately as the interviews and the interviewees' judgements permitted. If base population varied within the range of a plateau, costs were held constant. If the population fell below a critical population value, costs were reduced. If the population grew beyond a critical population value, additional costs were incurred.

Other costs were recurrent, but not every year. Examples of this type of cost are PCs and training. New PCs are purchased approximately every three years and, for a given employee, the same amount is not spent on training every year. For items that have cost functions with steps in time, a yearly average was applied. For example, a $2,000 PC purchased every third year was

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included in the MEO bid as part of a category other than overhead (e.g., cost of capital, material and supply), the government would still be paying for the service. Since total savings is the figure of interest to the government, this research assumes no transfer of mission from support organization to contractor and, therefore, avoids the "shell game" of funds that would accompany it.

modeled by the linear function Y = ($2,000/3)X, where Y is the annual cost of the PC and X is the number of PC-using civilians released as a result of the competition. The logic behind this is that not all support organizations on base incur these periodic costs at the same time. Some organizations will purchase PCs one year, other organizations will purchase them the next year, and others will purchase them the year after that. Consequently, on average, it was thought to be reasonable to model these periodic costs with a function that did not vary with time.

The last category of recurring costs were those that depended on the specific people who use the item, and would change only if the specific individuals released as a result of the competition used the service. For example, day care center and base gym expenses are affected by outsourcing only if the specific individuals released (i.e., civilians in the MEO and individuals in support organizations) use these services. For items with such a "probabilistic cost function," the expected value of usage reduction was computed. When calculating the expected value of usage reduction or growth, it was assumed the probability of a person using the service would remain constant as base population changed. For example, to estimate the change in base gym expenses that result from outsourcing, the probability that a civilian uses the base gym was calculated. This probability was multiplied by the cost of wear-and-tear imposed on the perishable equipment (e.g., aerobic equipment) by an individual to obtain a coefficient for the impact on cost of the number of civilians displaced due to the competition. Budget items that fell into this category were insignificant with respect to the final overhead rate calculated and, in most cases, can be used by contract personnel on base, as well as military and DoD civilians. Consequently, in reality, any reduction in cost for items in this category that results from a reduction in the number of DoD civilians on base may be counteracted by an increase in the number of contract personnel who use the service. The result is that these functions may overestimate overhead savings (and the OHR) in these cases.

Overhead costs incurred by contract administrators and quality assurance personnel employed as a result of the CA being outsourced are included since they are not considered in the contractor's bid when developing the cost of contractor performance.

The cost functions and assumptions used in this portion of the model are listed in Appendix D.

### 3.3.7 Estimating Total Overhead Savings That Result From Outsourcing a CA

Once the estimates of DLC and budget-request savings are calculated for each support organization, they are summed to derive an estimate of total overhead savings that result from the MEO being outsourced.

Higher headquarters (HQ) (e.g., command HQ, HQ USAF) savings were not included in the estimate because they are assumed to be insignificant if only one base outsources a CA. This assumption is based on the inflexibility of authorized manpower for wing and group commanders' support staffs on the outsourcing base. The concept is that since HQ costs on the outsourcing base usually aren't affected by outsourcing, then the probability of higher HQ costs being affected is small and, when they are, the change is insignificant with respect to total overhead savings.

### 3.3.8 The Civilian Personnel Office (CPO) Is a Unique Support Organization

All "normal" support organizations (i.e., all support organizations other than the Civilian Personnel Office) included in the model have AFMS workload factors that include both military and civilian populations. As a result, the values of their workload factors are reduced if a precompetitive organization is converted to an MEO,[29] and reduced further if the CA is outsourced. This means the savings obtained from each normal support organization by outsourcing an MEO cannot be greater than the savings obtained by outsourcing the CA's precompetitive organization.

Unlike all other support organizations, the CPO's workload factor includes only the base's civilian population and, therefore, since all military authorizations are converted to civilian authorizations when constructing an MEO, can increase when the CA's precompetitive organization is converted into the MEO. For example, if a CA's precompetitive organization consists of 20 military personnel and zero civilians, then the MEO, made up of all civilians, will increase the base's civilian population. Consequently, even if the base's total authorizations fall, if the number of civilian authorizations increases, the CPO's manning could grow.

[29] This assumes the WkYr TR is between zero and 1.0 (i.e., $0 < \text{WkYr TR} < 1.0$).

The concept of savings for normal support organizations is clear. Since the 12 percent overhead rule applies to the MEO, savings is the difference in costs for the support organization between MEO performance of the CA and outsourcing. The result for each support organization is a non-negative number that is less than or equal to the difference in costs between the CA's precompetitive organization performing the CA and outsourcing.

This is not the case for the CPO. Since it can grow in size by converting the CA's precompetitive organization to the MEO, the concept of savings for the CPO can be confusing. The cost of the CPO if the MEO performs the CA can be greater than its cost if the precompetitive organization performs the CA. In other words, unlike all normal support organizations, the savings by outsourcing the MEO can be greater than the savings obtained by outsourcing the CA's precompetitive organization. However, if the CA is outsourced the MEO isn't implemented, so the additional costs that would have been incurred by a larger Civilian Personnel Office (i.e., resulting from implementing the MEO) are avoided. For three notional precompetitive CAs, Table 3-4 illustrates the manning effects of the government organization performing the CA and their implications for support organization costs.

**Table 3-4 – Effect on Support Organization Savings By Implementing MEO and Outsourcing**
**(WkYr TR = .75)**

| Composition of CA's Precompetitive Organization | Support Organization (SO) | Savings If CA's Precompetitive Org Performs CA | | Savings If MEO Performs CA | | Savings If CA is Outsourced | |
|---|---|---|---|---|---|---|---|
| | | CA Manning | SO Savings | CA Manning | SO Savings | CA Manning | SO Savings |
| 100 Military, | Normal Spt Org | 100 Military, | 0 | 0 Mil, | >= 0 | 0 Mil, | >= 0 |
| 0 Civilians | Civ Pers Office | 0 Civilians | 0 | 75 Civ | <= 0 | 0 Civ | >= 0 |
| 50 Military, | Normal Spt Org | 50 Military, | 0 | 0 Mil, | >= 0 | 0 Mil, | >= 0 |
| 50 Civilians | Civ Pers Office | 50 Civilians | 0 | 75 Civ | <= 0 | 0 Civ | >= 0 |
| 0 Military, | Normal Spt Org | 0 Military, | 0 | 0 Mil, | >= 0 | 0 Mil, | >= 0 |
| 100 Civilians | Civ Pers Office | 100 Civilians | 0 | 75 Civ | >= 0 | 0 Civ | >= 0 |

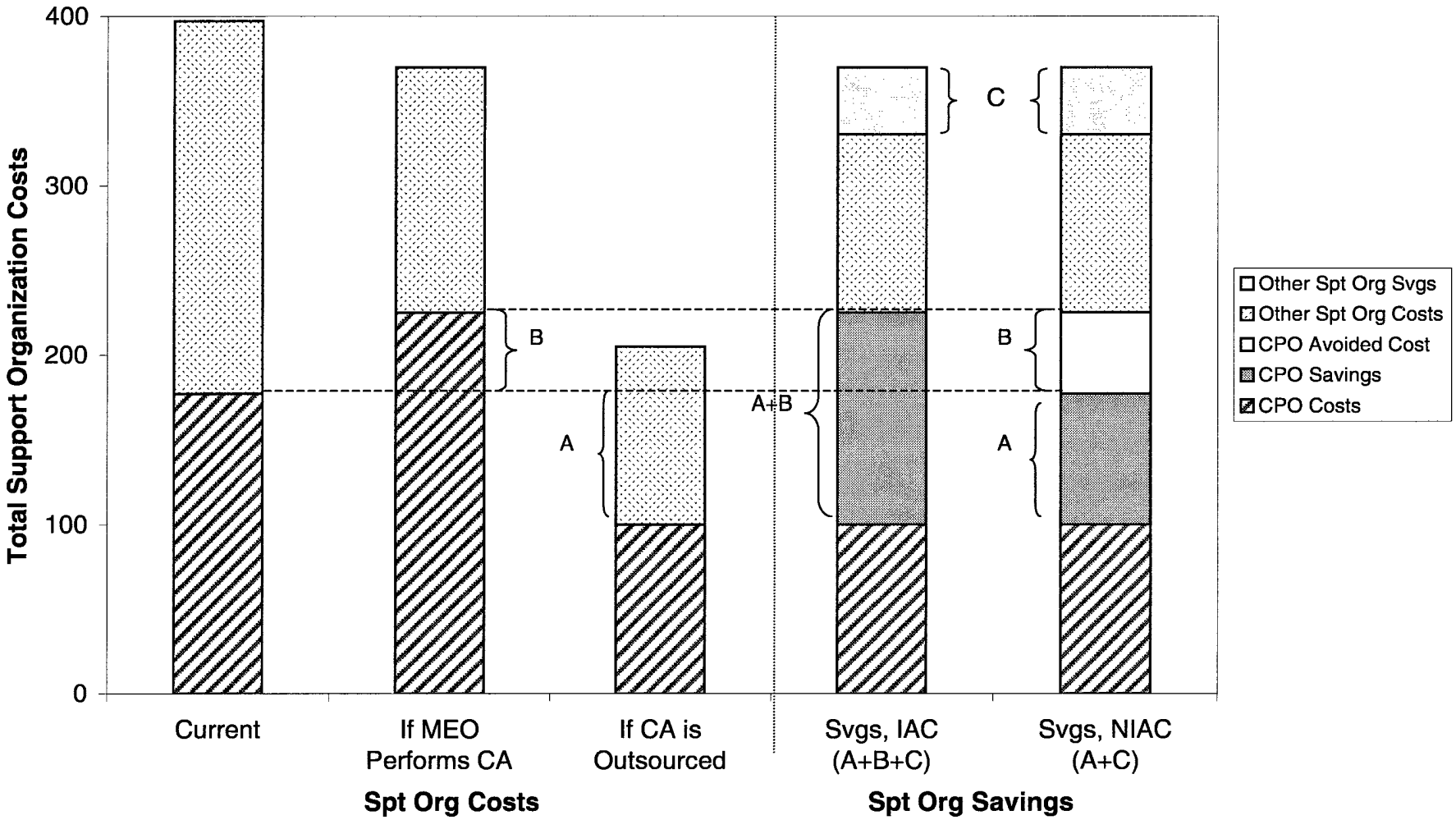
Assume the CA's precompetitive organization consists of 100 authorizations and the WkYr TR is .75. Then, regardless of the composition of the CA's precompetitive org, the MEO will consist of 75 civilians and zero military authorizations. Also regardless of the composition of the CA's precompetitive organization, if the CA is outsourced there will be zero military and zero civilian authorizations performing it. The savings from each support organization between MEO performance of the CA and outsourcing, however, will depend on the workload factors that drive its manning and budget requirements.

All normal support organizations included in the model have a workload factor that includes both military and civilian authorizations. Since their manning is dependent on the base's total number of authorizations, which is reduced by 25 (i.e., 100 - 75), their savings will be greater than or equal to zero, depending on if the drop in total authorizations was large enough to affect their manning. The Civilian Personnel Office's workload factor, however, includes only civilian authorizations; it doesn't consider military authorizations. Consequently, even if total authorizations fall, if the number of civilian authorizations grows, its manning could grow if the increase in civilian authorizations was large enough[30] and, therefore, its savings could be negative (i.e., its costs could be higher if the MEO were implemented than if the CA's precompetitive organization continued performing the CA). Of course, if the CA were outsourced, then the savings from the Civilian Personnel Office will, like all other support organizations, be greater than or equal to zero, depending on the size of drop in civilian authorizations. Therefore, a differentiation is made between "Savings, Including Avoided Costs" and "Savings, Not Including Avoided Costs."

The range indicated with a "B" in Figure 3-3 represents the additional costs that would be incurred by a larger CPO if the MEO were implemented, but would be avoided if the CA were outsourced. The term "Savings, Including Avoided Costs" (SIAC) refers to the difference in costs for all support organizations (i.e., normal and CPO) between MEO performance of the CA

[30] The CPO's workload factor will increase if the number of civilian authorizations in the CA's precompetitive organization is less than the MEO's population (i.e., # civs in Precompetitive CA < population of precompetitive CA * WkYr TR). However, CPO manning will only increase if the increase in its workload factor is enough to increase the value of Y in its manning equation, Y = X / 88, beyond the next integer value. For example, if the number of civilian authorizations on base is 1,000 if the CA's precompetitive organization performs the CA, then required CPO manning is Y = 1,000 / 88 = 11.36 ≈ 12 authorizations. Required CPO manning will not increase until the number of civilian authorizations on base increases to 12 * 88 + 1 = 1,057.

## Figure 3-3 - Savings, Including and Not Including Avoided Costs



and outsourcing. It is represented by the range A+B (CPO savings including avoided costs) plus range C (normal support organization savings) in Figure 3-3. The term "Savings, Not Including Avoided Costs" (SNIAC) refers to the difference in costs for: (1) all normal support organizations between MEO performance of the CA and outsourcing (range C in Figure 3-3), and (2) the CPO between precompetitive organization performance of the CA and outsourcing (range A in Figure 3-3). When simulating outsourcing scenarios, savings were computed both ways (i.e., including avoided costs and not including avoided costs). Since one of the objectives of this research is to determine the accuracy of OMB's 12 percent estimate, when results are reported, if it is not explicitly stated whether avoided costs are included or not, it may be assumed that avoided costs are included since this is the appropriate result to compare to OMB's 12 percent overhead rate.

### 3.3.9 Support Organizations as CAs

Conceptually, estimating total overhead savings has, thus far, been a fairly straightforward process, and if the CA being outsourced is not a support function itself, the discussion would be complete. However, if the CA being outsourced is a support function that is affected by base civilian population (e.g., Transportation Squadron, Communications Squadron), or if support functions were outsourced prior to the current competition, estimating overhead costs saved is more complex.

Overhead costs are saved as a result of a CA being outsourced because support functions, currently performed by the government, can realize savings through reduced DLC and budget requirements. However, if a support function is not performed by the Government, but rather by a contractor, then the savings that will accrue to the Government will depend on the specifics of the contract. For example, since the Transportation Squadron is sensitive to base population and it provides significant support to the Aerial Port Squadron, if the Aerial Port Squadron were outsourced, savings can be realized by the Transportation Squadron through reduced manning authorizations and, if the contractor must supply his own vehicles, a reduction in mission costs (e.g., vehicles and vehicle maintenance). However, if the Transportation Squadron is outsourced prior to the Aerial Port being outsourced and the contract governing payments to the contractor

(i.e., the transportation supplier) has no provision for reducing payments due to a reduced workload, the transportation function will no longer be a possible source of overhead cost reduction. In other words, for every CA outsourced after the Transportation Squadron, the Air Force will not realize any savings from reducing the size of the Transportation Squadron (or reducing the workload on the transportation function). As increasing numbers of support functions are outsourced, the potential savings from overhead sources will decrease. Savings will increasingly be limited to reductions in direct costs as potential savings from overhead sources in future A-76 competitions are transferred from the government to contractors performing those functions. Consequently, unless contracts for outsourced support activities are written in such a way as to let the Air Force reap some benefit of lower contractor costs, it loses the potential to claim any significant overhead savings from those support activities. Such contracts should be expected since one of the seven DoD policy principles regarding outsourcing is to share resources saved.[31]

For the purposes of this research, it was assumed that contracts for outsourced support functions were written in a way that would allow the government to accrue the same overhead savings as if it were performing the support function itself. The effect of this assumption is to overestimate overhead savings and, therefore, the OHR results.

## 3.4 Outsourcing Scenarios

The model was constructed to estimate overhead cost savings that will result from any combination of CAs being outsourced. To calculate the overhead rate that represents the estimated overhead cost savings that result from outsourcing, the model was run with the following scenarios: (1) one CA at a time, (2) bundles of related CAs, (3) arbitrary bundles of CAs with approximately the same number of authorizations as individual CAs or related bundles, and (4) all CAs on base.

[31] DoD policy regarding outsourcing is contained in DoD Directive 4100.15, *Commercial Activities Program* (1989) and DoD Instruction 4100.33, *Commercial Activities Program Procedures* (1985). The Directive includes the following seven policy principles: (1) ensure DoD mission accomplishment, (2) achieve economy and quality through competition, (3) retain governmental functions in-house, (4) rely on the commercial sector, (5) delegate decision authority and responsibility, (6) share resources saved, and (7) provide placement assistance to displaced employees.

The intent was to see if there were any synergies from outsourcing related functions versus merely outsourcing many functions.

CAs were modeled without regard to legal issues, size, number of authorizations,[32] mobility requirements, or probability of the Air Force competing it. The intent was to estimate the overhead costs that would be eliminated if the Air Force outsourced everything other than governmental functions. A list of all CAs and combinations of CAs "outsourced" is in Appendix B.

## 3.5 Sensitivity Analyses

In order to estimate overhead savings (i.e., the numerator of the overhead rate formula) that result from outsourcing CAs on Travis AFB, several "base case" assumptions were made: (1) the MEO's size would be 75 percent as large as the precompetitive organization's (i.e., WkYr TR = .75), (2) the changes in budget requirements, collected by interview, are accurate, (3) military authorizations are eliminated before civilian authorizations, and (4) the weighted average DLC of the type of authorization (i.e., enlisted, officer, or civilian) being eliminated from the support organization is a reasonable estimate of DLC saved as a result of an authorization being eliminated. In order to estimate the overhead rate for CAs on Travis AFB, a fifth assumption was made: (5) the MEO's DLC would be 75 percent of the precompetitive organization's.

Because it might have been possible that the results produced by the model were sensitive to the assumptions used, sensitivity analyses were performed to systematically test the effects of the different assumptions. The values modeled for each of these assumptions are listed in Table 3-5, below. The values in the center column (and in bold print) are the base case values. Throughout this paper, if results are reported without specifically stating values for these five variables, the values used are the base case values.

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[32] Since late 1982, Congress has, for the most part, generally prohibited DoD from contracting for firefighters and security guards. The prohibition against contracting for these services does not apply (1) when the contract is to be performed overseas, (2) when the contract is to be performed on government-owned but privately operated installations, and (3) when the contract (or renewal of the contract) is for the performance of a function already under contract as of September 24, 1983. In addition, CAs with 10 or fewer authorizations were modeled even though they could be outsourced using a direct conversion rather than an A-76 competition.

## Table 3-5 – Sensitivity Analysis Values

| Transformation Rate | "Base Case" Values | Values Modeled |
|---|---|---|
| Work-Year Transformation Rate | **0.75** | 0.01, 0.05 to 1.0, at intervals of .05 |
| Budget Awarded Transformation Rate | **1.0** | .50, **1.0**, 1.5 |
| Priority of Authorization Type Eliminated | **Eliminate Military Auths First** | **Eliminate Military Authorizations First**<br>Eliminate Civilian Authorizations First |
| Rank/Grade of Authorization Eliminated | **Wtd Avg DLC of Auth Type Eliminated** | **Wtd Avg DLC of Auth Type Eliminated**<br>Lowest Rank/Lowest DLC<br>Highest Rank/Highest DLC |
| DLC Transformation Rate | **0.75** | **.75** |

### 3.5.1 Work Year Transformation Rate (WkYr TR)

To see the effect the WkYr TR had on the overhead rate, 21 values were modeled over the entire range from 0.01 to 1.0, at intervals of 5 percent (i.e., .05). The first value modeled was .01 rather than 0.0 for both a logical and practical reason. Logically, a WkYr TR = 0.0 means that zero personnel can perform the CA, regardless of the size of the precompetitive organization. This doesn't make sense unless the CA is totally automated. In reality, if this were the case, then overhead becomes a much smaller issue since all overhead costs for machinery can be converted to direct costs by installing meters. Therefore, it didn't seem necessary to model a WkYr TR = 0.0. Practically, a WkYr TR = 0.0 caused a problem with some formulas in Excel because it caused a division by zero. Other than this one aberration, all values were run as desired, at 5 percent intervals from .05 to 1.0. All other values in Table 3-5 should be clearly interpretable.

### 3.5.2 Sensitivity Analyses Performed

For each CA outsourced, an overhead rate was calculated for all combinations of treatment values. In other words, 378 overhead rates were calculated for each CA outsourced (i.e., 21 values for WkYr TR x 3 values for Budget TR x 2 priorities of authorization removal x 3 rank/grade removal algorithms = 378). Overhead rates were calculated both including and not

including avoided costs, so a grand total 756 overhead rates were calculated for each CA outsourced.

### 3.5.3 Direct Labor Cost Transformation Rate (DLC TR)

Generally, sensitivity analysis on the DLC TR was not calculated or reported. This is because it can easily be performed by the reader. Since the DLC of the MEO was only used in the denominator of the overhead rate formula and had no part in calculating the numerator, the results reported in this paper can be adjusted to those of an alternate DLC TR by multiplying the results by .75/x, where x is the preferred transformation rate.

### 3.5.4 Sensitivity Analysis Isn't Necessary In an A-76 Competition

It should be realized that while sensitivity analysis was important for the purposes of this research, it isn't necessary when computing OHC savings that will result from an A-76 competition. Once the MEO is constructed, both the WkYr TR and the DLC TR will be known. No assumptions will be necessary. This model can be used at that in an A-76 competition to obtain a fairly accurate estimate of the actual overhead costs that will be saved as a result of the competition, which could then be used as the estimate of overhead in the government bid. The actual reduction in CA personnel can be entered into the model for a fairly accurate estimate of overhead cost savings that will occur as a result of the competition. Or if desired, the model can be used just to compute the number of authorizations that will be eliminated from each support organization and have the Manpower Office identify the specific authorizations that will be eliminated. This will give an even more accurate estimate of DLC savings that will be obtained.

# Chapter 4 Findings and Conclusions

This chapter summarizes the findings and states conclusions.

## 4.1 Summary of Results

Table 4-1 summarizes results for all CAs. Table 4-2 defines the combinations of CAs (i.e., it lists each combination with the individual CAs they contain). All OHRs in Table 4-1 assume a DLC TR = .75, which means the MEO's DLCs are 75 percent of the precompetitive CA organization's DLCs. For each CA outsourced, the first two columns in the table list its "base case" OHR and its relative rank, by OHR, among all 45 CAs. Notice that the highest "base case" OHR is 7.55 percent, the lowest is –0.04 percent,[1] the average OHR is 2.3 percent, and the standard deviation is 1.95 percent. Recall (from chapter 3) that the base-case OHR includes avoided costs (for Civilian Personnel Office expansion) and is estimated assuming the Ret Civ and Wtd Avg algorithms are used. It also assumes a WkYr TR = .75, a Budget TR = 1.0, and a DLC TR = .75.

The next eight columns list ranges of OHRs for each CA. The first two ranges are for the Ret Civ-Wtd Avg and Ret Mil-Wtd Avg algorithms, the third and fourth ranges include the Lo and Hi DLC elimination algorithms, as well. Obviously, the OHR produced by the Wtd Avg DLC elimination algorithm falls within the range of the Lo and Hi algorithms. Since the Wtd Avg algorithm is assumed to be the one that best simulates reality, and because the Lo/Hi range can be misleading, the Wtd Avg algorithm's range is listed separately to give the reader an idea of where it falls within the larger Lo/Hi range.[2]

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[1] As will be discussed in more detail in section 4.4.3, an OHR can be negative for small MEOs because the overhead costs incurred by employing contract administrators can exceed the overhead savings realized by eliminating such a small MEO.

[2] One unusually high or low ranking authorization in a support organization can significantly skew the Lo/Hi range. For example, an organization whose high and low ranking authorizations are one Colonel and 35 A1Cs will, in reality, probably lose an A1C (or similar) authorization first. The Wtd Avg DLC elimination algorithm will eliminate a DLC close to the A1C's DLC. The Hi DLC elimination algorithm will eliminate the Colonel's DLC. The effect is that the Lo/Hi range for that support organization will span from an A1C to a Colonel, which doesn't give the reader any idea of the rank structure within the support organization or the likelihood of the DLCs saved.

# Table 4-1 - Summary of Results

(DLC TR = .75)

| Commercial Activity | Overhead Rate Summary, Including Avoided Costs (Percent) | | | | | | | | | | DLC | | Precompetitive Personnel Populations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | | Ret Civ-Wtd Avg | | Ret Mil-Wtd Avg | | Ret Civ-Lo/Hi | | Ret Mil-Lo/Hi | | | | | | | | |
| | Rate | Rank | Low | High | Low | High | Low | High | Low | High | DLC | Rank | Off | Enl | Civ | Total | Rank |
| **Logistics Group** | | | | | | | | | | | | | | | | | |
| **Logistics Group, minus Contracting Squadron (Combo 7)** | 3.25 | 14 | 0.02 | 4.39 | 0.01 | 4.49 | 0.02 | 5.51 | 0.01 | 4.91 | 98,087,440 | 4 | 37 | 1,936 | 262 | 2,235 | 3 |
| **Supply Squadron (Combo 2)** | 3.12 | 15 | 0.00 | 4.33 | -0.01 | 3.99 | 0.00 | 5.51 | -0.01 | 4.39 | 16,430,696 | 14 | 6 | 315 | 65 | 386 | 11 |
| Fuels Management | 6.60 | 2 | -0.02 | 6.79 | -0.03 | 4.92 | -0.02 | 9.04 | -0.03 | 4.92 | 3,879,375 | 24 | 1 | 82 | 9 | 92 | 23 |
| Hazardous Materials | 0.16 | 35 | 0.02 | 0.34 | 0.00 | 0.30 | 0.02 | 0.34 | 0.00 | 0.30 | 278,931 | 42 | 0 | 5 | 1 | 6 | 41 |
| Individual Equipment Element (i.e., Military Clothing) | 0.17 | 33 | -0.09 | 0.32 | -0.12 | 0.29 | -0.09 | 0.32 | -0.12 | 0.29 | 428,138 | 38 | 0 | 8 | 2 | 10 | 38 |
| **Transportation Squadron** | 4.03 | 8 | 0.00 | 4.27 | -0.01 | 3.12 | 0.00 | 5.64 | -0.01 | 3.12 | 6,351,729 | 22 | 2 | 102 | 34 | 138 | 21 |
| **60 Aircraft Generation Squadron** | 3.08 | 16 | 0.00 | 4.47 | 0.00 | 4.17 | 0.00 | 6.12 | 0.00 | 4.46 | 28,184,336 | 7 | 8 | 571 | 41 | 620 | 5 |
| **660 Aircraft Generation Squadron** | 2.66 | 21 | 0.00 | 3.88 | 0.00 | 3.53 | 0.00 | 4.80 | 0.00 | 3.67 | 16,248,624 | 15 | 5 | 369 | 0 | 374 | 13 |
| **60 Component Repair Squadron** | 2.63 | 22 | -0.04 | 3.52 | -0.05 | 2.83 | -0.04 | 4.34 | -0.05 | 2.83 | 10,607,336 | 16 | 3 | 198 | 32 | 233 | 16 |
| **60 Equipment Maintenance Squadron** | 2.48 | 26 | 0.00 | 3.63 | 0.00 | 3.31 | 0.00 | 4.77 | 0.00 | 3.69 | 17,098,003 | 12 | 6 | 282 | 72 | 360 | 14 |
| **60 Logistics Support Squadron** | 5.48 | 3 | -0.01 | 5.63 | -0.02 | 4.08 | -0.01 | 7.50 | -0.02 | 4.08 | 4,673,631 | 23 | 3 | 77 | 11 | 91 | 25 |
| **Operations Group** | | | | | | | | | | | | | | | | | |
| **Aerial Port Squadron** | 2.62 | 23 | -0.01 | 4.93 | -0.01 | 4.34 | -0.01 | 6.68 | -0.01 | 5.21 | 18,338,876 | 11 | 7 | 307 | 101 | 415 | 10 |
| **Support Group** | | | | | | | | | | | | | | | | | |
| **Civil Engineering (Combo 3)** | 2.79 | 20 | -0.01 | 4.34 | -0.01 | 4.19 | -0.01 | 5.83 | -0.01 | 5.29 | 23,646,113 | 8 | 12 | 324 | 156 | 492 | 8 |
| Heating Plant (Heat/Steam Ops) | 0.13 | 39 | 0.02 | 0.29 | 0.00 | 0.24 | 0.02 | 0.29 | 0.00 | 0.24 | 288,154 | 41 | 0 | 0 | 5 | 5 | 42 |
| Housing Management | 0.16 | 36 | -0.06 | 0.23 | -0.09 | 0.21 | -0.06 | 0.23 | -0.09 | 0.21 | 586,531 | 34 | 0 | 0 | 13 | 13 | 35 |
| CE Material Acquisition | -0.01 | 43 | -0.06 | 0.23 | -0.09 | 0.21 | -0.06 | 0.23 | -0.09 | 0.21 | 683,752 | 33 | 0 | 11 | 5 | 16 | 33 |
| Entomology | 0.19 | 31 | 0.03 | 0.38 | 0.00 | 0.29 | 0.03 | 0.38 | 0.00 | 0.29 | 143,121 | 45 | 0 | 2 | 1 | 3 | 45 |
| Fire Protection | 7.55 | 1 | -0.03 | 7.72 | -0.03 | 5.54 | -0.03 | 10.34 | -0.03 | 5.54 | 3,338,010 | 26 | 0 | 71 | 11 | 82 | 26 |
| **Communications Squadron (Combo 4)** | 2.11 | 28 | 0.00 | 4.10 | -0.01 | 3.29 | 0.00 | 5.07 | -0.01 | 3.29 | 8,996,033 | 17 | 9 | 153 | 26 | 188 | 18 |
| ATCALS Maintenance | 0.15 | 37 | 0.02 | 0.35 | 0.00 | 0.29 | 0.02 | 0.35 | 0.00 | 0.29 | 238,610 | 43 | 0 | 5 | 0 | 5 | 42 |
| Ground Radio Maintenance | 0.18 | 32 | -0.07 | 0.27 | -0.10 | 0.24 | -0.07 | 0.27 | -0.10 | 0.24 | 516,450 | 37 | 0 | 12 | 0 | 12 | 36 |
| Telephone Operations (Switchboard) | 0.26 | 30 | -0.11 | 0.39 | -0.14 | 0.35 | -0.11 | 0.39 | -0.14 | 0.35 | 352,816 | 40 | 0 | 0 | 12 | 12 | 36 |
| METNAV Maintenance | 0.17 | 34 | 0.02 | 0.38 | 0.00 | 0.32 | 0.02 | 0.38 | 0.00 | 0.32 | 215,368 | 44 | 0 | 5 | 0 | 5 | 42 |
| Telecommunications Center | 0.01 | 42 | -0.05 | 0.17 | -0.06 | 0.16 | -0.05 | 0.17 | -0.06 | 0.16 | 787,217 | 32 | 0 | 19 | 0 | 19 | 32 |
| Base Network Control | 4.38 | 5 | 0.00 | 4.59 | -0.01 | 0.36 | 0.00 | 9.68 | -0.01 | 0.36 | 1,716,611 | 28 | 1 | 32 | 3 | 36 | 29 |

# Table 4-1 - Summary of Results (continued)

(DLC TR = .75)

| Commercial Activity | Overhead Rate Summary, Including Avoided Costs (Percent) | | | | | | | | | | DLC | | Precompetitive Personnel Populations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base Case | | Ret Civ-Wtd Avg | | Ret Mil-Wtd Avg | | Ret Civ-Lo/Hi | | Ret Mil-Lo/Hi | | | | | | | | |
| | Rate | Rank | Low | High | Low | High | Low | High | Low | High | DLC | Rank | Off | Enl | Civ | Total | Rank |
| **Mission Support Squadron** | | | | | | | | | | | | | | | | | |
| Education Services | 0.12 | 40 | 0.01 | 0.26 | 0.00 | 0.24 | 0.01 | 0.26 | 0.00 | 0.24 | 519,687 | 36 | 0 | 4 | 5 | 9 | 39 |
| **Services Squadron (Combo 5)** | 3.69 | 10 | -0.01 | 4.91 | -0.01 | 3.90 | -0.01 | 6.74 | -0.01 | 4.51 | 7,182,735 | 20 | 3 | 75 | 78 | 156 | 20 |
| Fitness Center | -0.04 | 45 | -0.06 | 0.24 | -0.09 | 0.21 | -0.06 | 0.24 | -0.09 | 0.21 | 581,634 | 35 | 0 | 12 | 2 | 14 | 34 |
| Port Mortuary | 0.14 | 38 | 0.01 | 0.29 | 0.00 | 0.25 | 0.01 | 0.29 | 0.00 | 0.25 | 383,063 | 39 | 0 | 3 | 4 | 7 | 40 |
| Child Development Centers (3) | 4.85 | 4 | 0.00 | 5.11 | -0.01 | 0.44 | 0.00 | 10.72 | -0.01 | 0.44 | 1,556,441 | 29 | 0 | 0 | 41 | 41 | 27 |
| **Security Forces Squadron** | 3.30 | 12 | -0.01 | 4.41 | -0.02 | 3.54 | -0.01 | 5.46 | -0.02 | 3.54 | 8,367,774 | 18 | 3 | 197 | 2 | 202 | 17 |
| **60th Medical Group (Combo 6)** | 2.54 | 24 | 0.00 | 3.28 | -0.01 | 3.57 | 0.00 | 4.23 | -0.01 | 3.90 | 101,271,753 | 3 | 529 | 1,036 | 223 | 1,788 | 4 |
| **Medical Operations Squadron** | 2.31 | 27 | 0.00 | 3.26 | 0.00 | 2.92 | 0.00 | 4.33 | 0.00 | 3.12 | 31,996,925 | 5 | 210 | 271 | 62 | 543 | 7 |
| **Dental Squadron** | 3.98 | 9 | -0.01 | 4.13 | -0.02 | 3.00 | -0.01 | 5.50 | -0.02 | 3.00 | 6,400,729 | 21 | 26 | 73 | 6 | 105 | 22 |
| **Diagnostics and Therapeutics Squadron** | 2.48 | 25 | -0.01 | 3.61 | -0.01 | 3.28 | -0.01 | 4.75 | -0.01 | 3.67 | 17,019,908 | 13 | 46 | 234 | 56 | 336 | 15 |
| **Surgical Operations Squadron** | 1.90 | 29 | 0.00 | 2.78 | 0.00 | 2.53 | 0.00 | 3.44 | 0.00 | 2.63 | 22,693,806 | 9 | 167 | 194 | 18 | 379 | 12 |
| Combo 1 | 3.07 | 17 | 0.02 | 4.27 | -0.02 | 4.37 | 0.00 | 5.02 | -0.06 | 4.95 | 266,410,410 | 1 | 600 | 4,032 | 853 | 5,485 | 1 |
| Combo 8 | 3.37 | 11 | -0.05 | 5.62 | -0.05 | 4.69 | -0.05 | 7.29 | -0.05 | 5.25 | 7,836,179 | 19 | 2 | 125 | 58 | 185 | 19 |
| Combo 9 | 2.80 | 19 | -0.03 | 3.78 | -0.04 | 3.24 | -0.03 | 4.90 | -0.04 | 3.57 | 20,086,797 | 10 | 30 | 308 | 78 | 416 | 9 |
| Combo 10 | 4.33 | 6 | -0.12 | 4.53 | -0.12 | 2.56 | -0.12 | 8.07 | -0.12 | 3.74 | 3,694,330 | 25 | 0 | 27 | 65 | 92 | 23 |
| Combo 11 | 4.30 | 7 | 0.00 | 14.51 | -0.01 | 10.38 | 0.00 | 19.49 | -0.01 | 10.38 | 1,757,645 | 27 | 0 | 41 | 0 | 41 | 27 |
| Combo 12 | 0.08 | 41 | -0.13 | 0.13 | -0.19 | 0.12 | -0.13 | 0.13 | -0.19 | 0.12 | 1,227,502 | 31 | 0 | 0 | 30 | 30 | 30 |
| Combo 13 | -0.04 | 44 | -0.07 | 0.10 | -0.08 | 0.09 | -0.07 | 0.10 | -0.08 | 0.09 | 1,241,195 | 30 | 0 | 29 | 0 | 29 | 31 |
| Combo 14 | 2.87 | 18 | -0.03 | 3.90 | -0.03 | 3.39 | -0.03 | 5.48 | -0.03 | 3.60 | 29,410,812 | 6 | 33 | 469 | 118 | 620 | 5 |
| Combo 15 | 3.26 | 13 | 0.00 | 4.52 | -0.01 | 4.73 | 0.00 | 5.55 | -0.01 | 5.28 | 165,138,658 | 2 | 71 | 2,996 | 630 | 3,697 | 2 |
| Max --> | 7.55 | | | 14.51 | | 10.38 | | 19.49 | | 10.38 | | | | | | | |
| Avg --> | 2.30 | | | 3.19 | | 2.50 | | 4.36 | | 2.69 | | | | | | | |
| Std Dev --> | 1.95 | | | 2.77 | | 2.18 | | 3.94 | | 2.31 | | | | | | | |

## Table 4-2 - Key to Commercial Activity and Combination Names

| Individual Commercial Activities | | Definition of Combinations | |
|---|---|---|---|
| CA 1 | Fuels Management | Combination 1 | Everything |
| CA 2 | Hazardous Materials | Combination 2 | Supply Squadron |
| CA 3 | Individual Equipment Element | Combination 3 | Civil Engineering Squadron |
| CA 4 | Transportation Squadron | Combination 4 | Communications Squadron |
| CA 5 | 60 Aircraft Generation Sqdn | Combination 5 | Services Squadron |
| CA 6 | 660 Aircraft Generation Sqdn | Combination 6 | Medical Group |
| CA 7 | 60 Component Repair Sqdn | Combination 7 | Log Grp, Except Contracting Sqdn |
| CA 8 | 60 Equipment Maint Sqdn | Combination 8 | CAs 1, 13, 21, 25 |
| CA 9 | 60 Logistics Support Squadron | Combination 9 | CAs 1, 9, 15, 16, 25, 28 |
| CA 10 | Aerial Port Squadron | Combination 10 | CAs 9, 13, 18, 22, 23, 25 |
| CA 11 | Heating Plant | Combination 11 | CAs 16, 17, 19, 20 |
| CA 12 | Housing Management | Combination 12 | CAs 11, 12, 18 |
| CA 13 | CE Material Acquisition | Combination 13 | CAs 16, 19, 20 |
| CA 14 | Entomology | Combination 14 | CAs 1, 2, 3, 4, 9, 15, 20, 21, 25, 28 |
| CA 15 | Fire Protection | Combination 15 | Everything except Medical Group |
| CA 16 | ATCALS Maintenance | | |
| CA 17 | Ground Radio Maintenance | | |
| CA 18 | Telephone Ops (Switchboard) | | |
| CA 19 | METNAV Maintenance | | |
| CA 20 | Telecommunications Center | | |
| CA 21 | Base Network Control | | |
| CA 22 | Education Services | | |
| CA 23 | Fitness Center | | |
| CA 24 | Port Mortuary | | |
| CA 25 | Child Development Centers | | |
| CA 26 | Security Forces Squadron | | |
| CA 27 | Medical Operations Squadron | | |
| CA 28 | Dental Squadron | | |
| CA 29 | Diagnostics & Therapeutics Sqdn | | |
| CA 30 | Surgical Operations Squadron | | |

The OHR ranges include all sensitivity analyses (i.e., the WkYr TR was varied from .01 to .05 and then to 1.0 in increments of .05, the Budget TR was varied from .5 to 1.5 in increments of .5, and all three DLC elimination algorithms were included), unless specifically stated in the column heading (e.g., Ret Civ-Wtd Avg doesn't include the Hi and Lo DLC elimination algorithms). The OHR in the "High" column of each range is the maximum OHR produced by all sensitivity analyses. The OHR in the "Low" column is the minimum OHR produced by all sensitivity analyses. In addition, by combining the Ret Civ–Lo/Hi and Ret Mil–Lo/Hi columns

the reader can construct a new range which includes sensitivity analysis on the retention algorithm, as well. For example, the minimum OHR that will be eliminated by outsourcing the Security Forces Squadron if the Ret Civ algorithm is used, considering all combinations of WkYr TR, Budget TR, and DLC elimination algorithm (i.e., Ret Civ-Lo/Hi column), is estimated to be –0.01 percent (i.e., overhead costs increase). If the Ret Mil algorithm is used the minimum will be -0.02 percent. The maximum OHRs for the two algorithms, respectively, are estimated to be 5.46 and 3.54 percent. By combining the ranges from the Ret Civ and Ret Mil algorithms and identifying the new minimum and maximum OHRs, a new range can be constructed from -0.02 to 5.46 percent. This range will include all OHRs produced by all 378 combinations of assumptions (i.e., 21 values of WkYr TR x 3 values of Budget TR x 3 values of DLC elimination algorithm x 2 values of retention algorithm). Figure 4-1 provides some insight about the assumptions that produce the maximum and minimum OHRs.[3]

A significant conclusion that can be drawn from these results is that overhead savings probably shouldn't be a consideration when deciding which CAs to outsource because a significant majority of the savings from a competition are a direct result of implementing the MEO or outsourcing the CA rather than overhead savings. Recall that the base-case OHR assumed a DLC TR = .75 (i.e., MEO DLCs = 75 percent of precompetitive CA organization's DLCs). If a CA has a relatively high 4 percent OHR (less than 20 percent of the CAs [8 out of 45] have an OHR ≥ 4 percent), then total savings would be the same as if the DLC TR = .72 and the OHR were zero percent.[4] The point is that small percentage changes is MEO direct costs (labor and non-labor) can overshadow changes in overhead costs.

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[3] The low end of the range is frequently misleading. As can be seen in Figure 4-1, the MEO would have to be one fifth (1/5) the size of the precompetitive organization to reduce the OHR almost to zero, and it would have to be one tenth (1/10) the size of the precompetitive organization to reduce the OHR to -0.02. (The OHR is zero percent when the WkYr TR = .01 and 5.45 percent when WkYr TR = 1.0.)

[4] This assumes all other costs (e.g., materials, supplies) remain the same. Computations are below.

Total Savings if OHR = 4 percent:

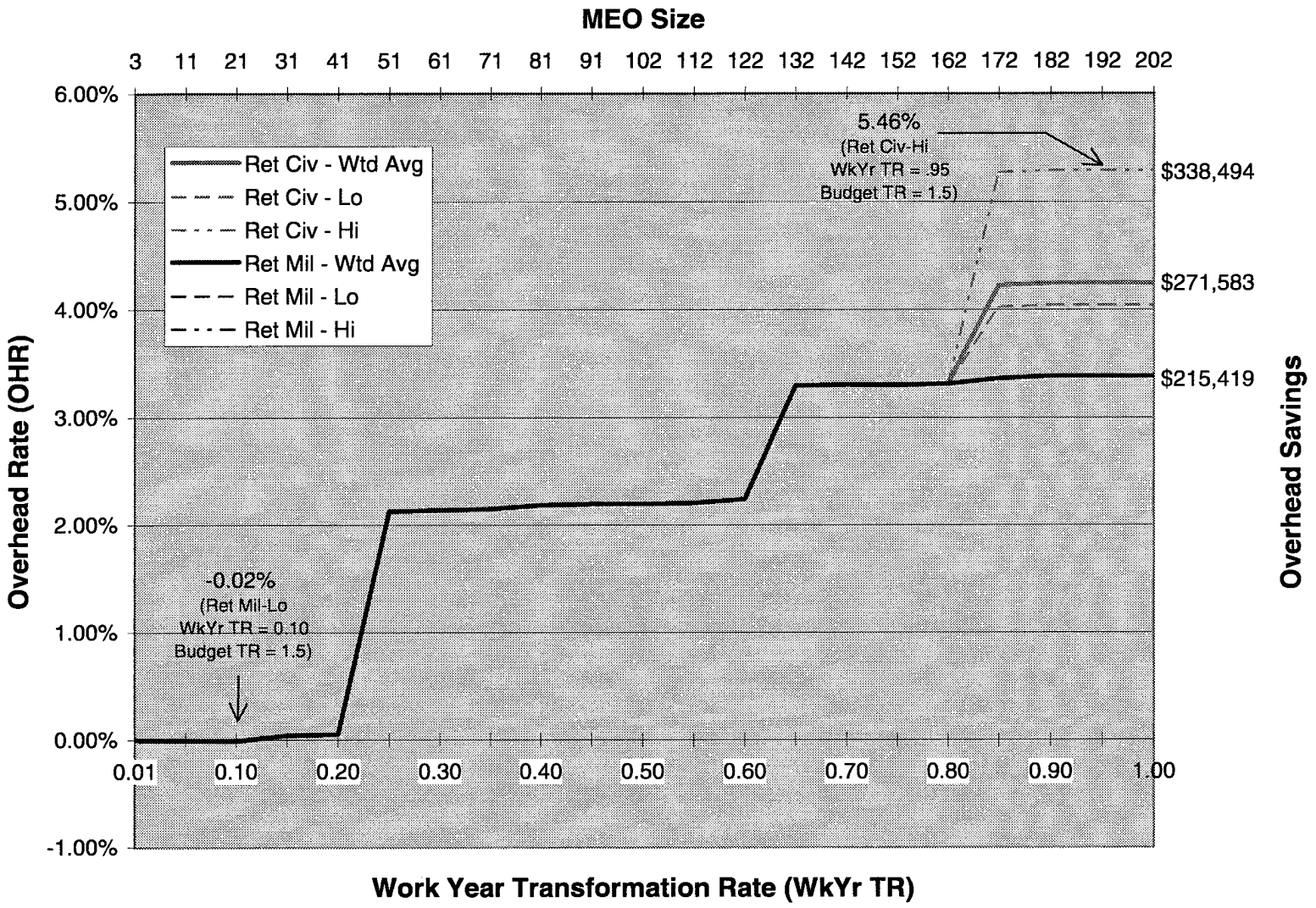
CA DLC Savings = Precompetitive CA org's DLC – MEO's DLC = 100 percent - 75 percent = 25 percent
Overhead Savings = MEO's DLCs x 4 percent OHR = 75 percent x 4 percent = 3 percent
Total Savings = CA DLC Savings + Overhead Savings = 25 percent + 3 percent = 28 percent of CA's DLCs

Total Savings if OHR = 0 percent:

CA DLC Savings = Precompetitive CA organization's DLC x 28 percent = 28 percent

## Figure 4-1 - Overhead Rates for CA 26 (Security Forces Squadron)

**for WkYr TR between 0 and 1.0; Budget TR = .5, 1.0, & 1.5; Includes Avoided Costs**



The last two sections (seven columns) in Table 4-1 list each CA's precompetitive DLCs and number of authorizations (with officer, enlisted, and civilian populations broken out) along with its relative rank (by DLC and size, respectively) out of 45.

## 4.2 General Findings

### 4.2.1 The Actual OHR on Travis AFB is Substantially Less Than 12 Percent

It is clear that the OHR eliminated by outsourcing at Travis AFB does not approach the OMB directed 12 percent. The maximum OHR produced by the base-case algorithm is 7.55 percent for Fire Protection. The average OHR is 2.3 percent with a standard deviation of 1.95 percent. Including all sensitivity analyses for the Wtd Avg DLC elimination algorithm, the maximum OHR is 14.51 percent for Combination 11 when the WkYr TR = 1.0 (i.e., the MEO size equals the precompetitive size), and the Budget TR = 1.5. If the WkYr TR falls to .95 (all other assumptions remain constant), the OHR for Combination 11 drops to 4.5 percent.[5] No other OHR approached 12 percent, regardless of the algorithm or transformation rates assumed. The second highest maximum OHR, including all sensitivity analyses, is 7.72 percent (i.e., for Fire Protection). The average maximum OHR for the Ret Civ-Wtd Avg algorithm is 3.19 percent with a standard deviation of 2.77 percent. The average and standard deviation of all maximum OHRs for the Ret Mil-Wtd Avg algorithm are 2.5 and 2.18 percent, respectively. The histogram in Figure 4-2 indicates that most maximum OHRs using the Wtd Avg algorithm are either below one percent (16) or between four and five percent (14), although there are a significant number between three and four percent (8), as well.

Even if the Hi DLC elimination algorithm is used, Combination 11 is the only CA with a maximum OHR above 12 percent (i.e., 19.49 percent). The second highest maximum was 10.72 percent. The average OHR for the Ret Civ-Hi algorithm is 4.36 percent with a standard

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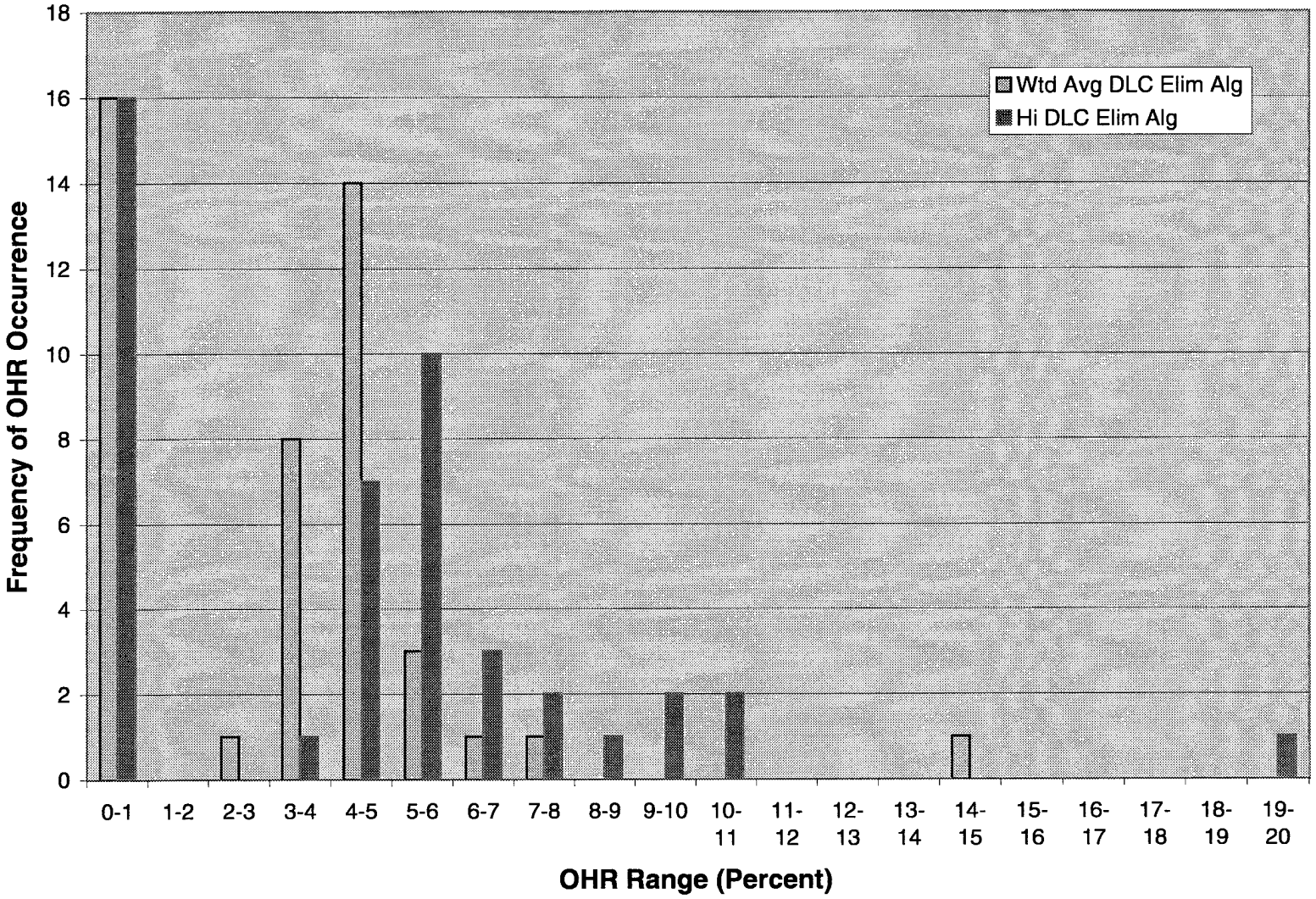
Overhead Savings = MEO's DLCs x zero percent OHR = 75 percent x 0 percent = 0 percent
Total Savings = CA DLC Savings + Overhead Savings = 28 percent + 0 percent = 28 percent of CA's DLCs

[5] The large drop in OHR is due to Combination 11's relatively low DLCs and a reduction of two support organization authorizations between WkYr TR = 1.0 and .95. The low DLC was a significant factor in producing the high OHR when the WkYr TR = 1.0, as well.

## Figure 4-2 - Comparative Histogram of Maximum OHRs



deviation of 3.94 percent. The average and standard deviation for the Ret Mil-Hi algorithm are 2.69 and 2.31 percent, respectively. The histogram in Figure 4-2 indicates that most maximum OHRs using the Hi DLC elimination algorithm are either below one percent (16) or between five and six percent (10), although there are a significant number between four and five percent (7), as well.

### 4.2.2 Labor Accounts for Most Overhead Savings

For CAs large enough ( $\geq 35$ authorizations) to produce a reduction in support organization authorizations, DLC savings account for approximately 90 percent of total overhead savings.[6] For a WkYr TR = .75, a Budget TR = 1.0, and a RetCiv-Wtd Avg algorithm, the average percentage of overhead savings that is attributable to reductions in DLC is 92.8, with a standard deviation of 1.4 percent.[7] For the Ret Mil-Wtd Avg algorithm, the average is 92.41 percent with a standard deviation of 1.35 percent. Typical functions representing the percent of total overhead savings attributable to reductions in DLC are illustrated in Figures 4-3A and B. As the WkYr TR grows from .01 to 1.0, DLC's share of total savings is zero percent until the MEO gets large enough to cause a support organization authorization to be eliminated when the MEO is outsourced, at which point DLC savings immediately jump to approximately 90 percent of total savings, where it remains until WkYr TR = 1.0. The pattern is consistent regardless of the MEO's size or retention algorithm used.

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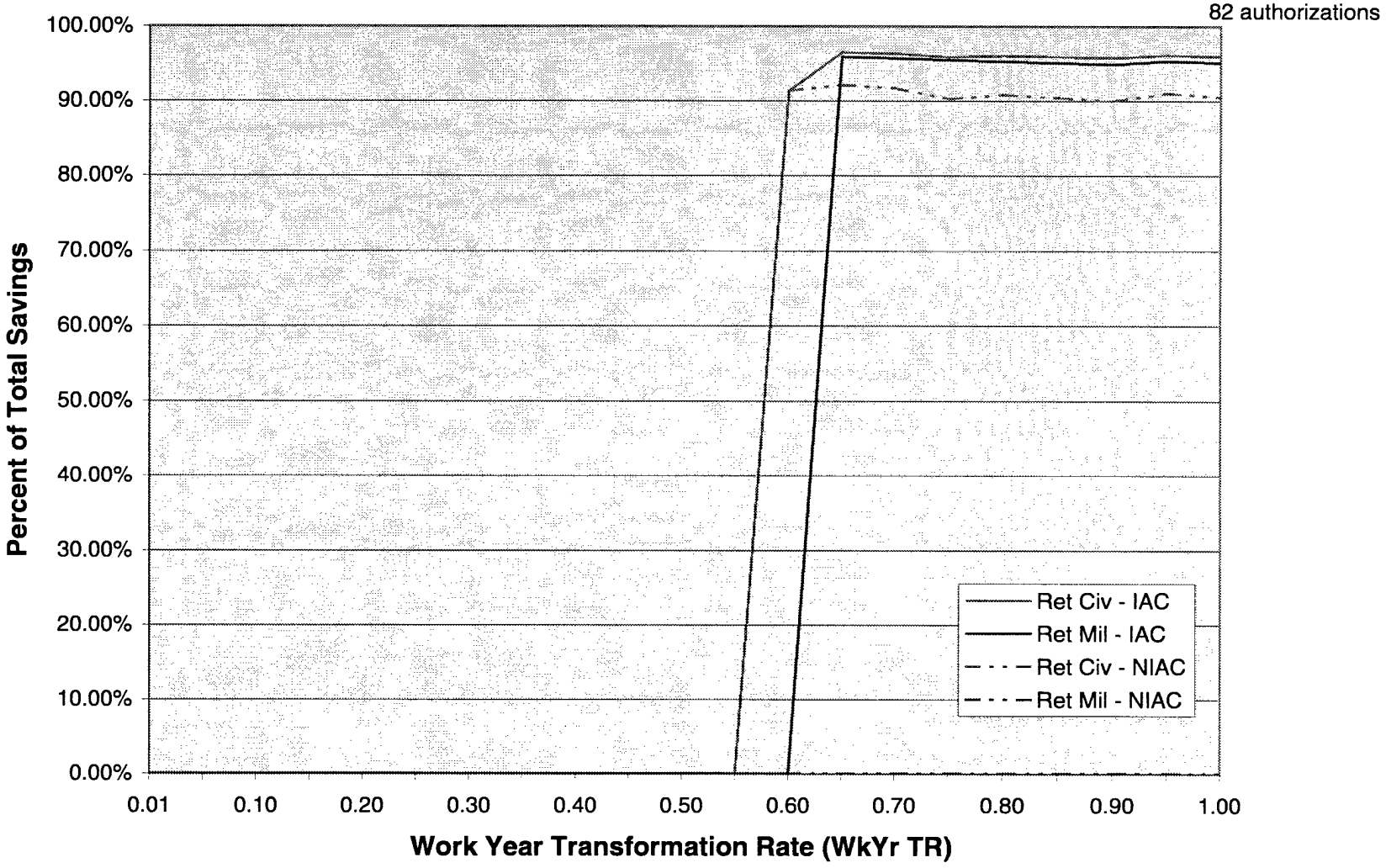
[6] The 90 percent assumes a Budget TR = 1.0. With a Budget TR = 1.5, the share of DLC savings would be approximately 86 percent. With a Budget TR = 0.5, the share of DLC savings would be approximately 95 percent. To illustrate, assume an example with DLC savings of \$90 and budget savings of \$10. The general formula is: DLC share = DLC savings / [DLC savings + (budget savings x Budget TR)]. Computations are below:

Budget TR = 1.0: 90 / [(90 + (10 x 1.0)] = 90 / 100 = .90, or 90 percent
Budget TR = 1.5: 90 / [(90 + (10 x 1.5)] = 90 / 105 = .857, or 85.7 ≈ 86 percent
Budget TR = 0.5: 90 / [(90 + (10 x 0.5)] = 90 / 95 = .947, or 94.7 ≈ 95 percent

[7] The averages and standard deviations were computed including avoided costs using only the MEOs that were large enough to produce reductions in support organization manning (i.e., where DLC reductions were greater than zero). If avoided costs are not included, the percent is lower (i.e., approximately 85 percent), but the pattern is still fairly consistent. If there are no reductions in support organization manning, the share of overhead savings attributable to DLC reductions will be zero percent.

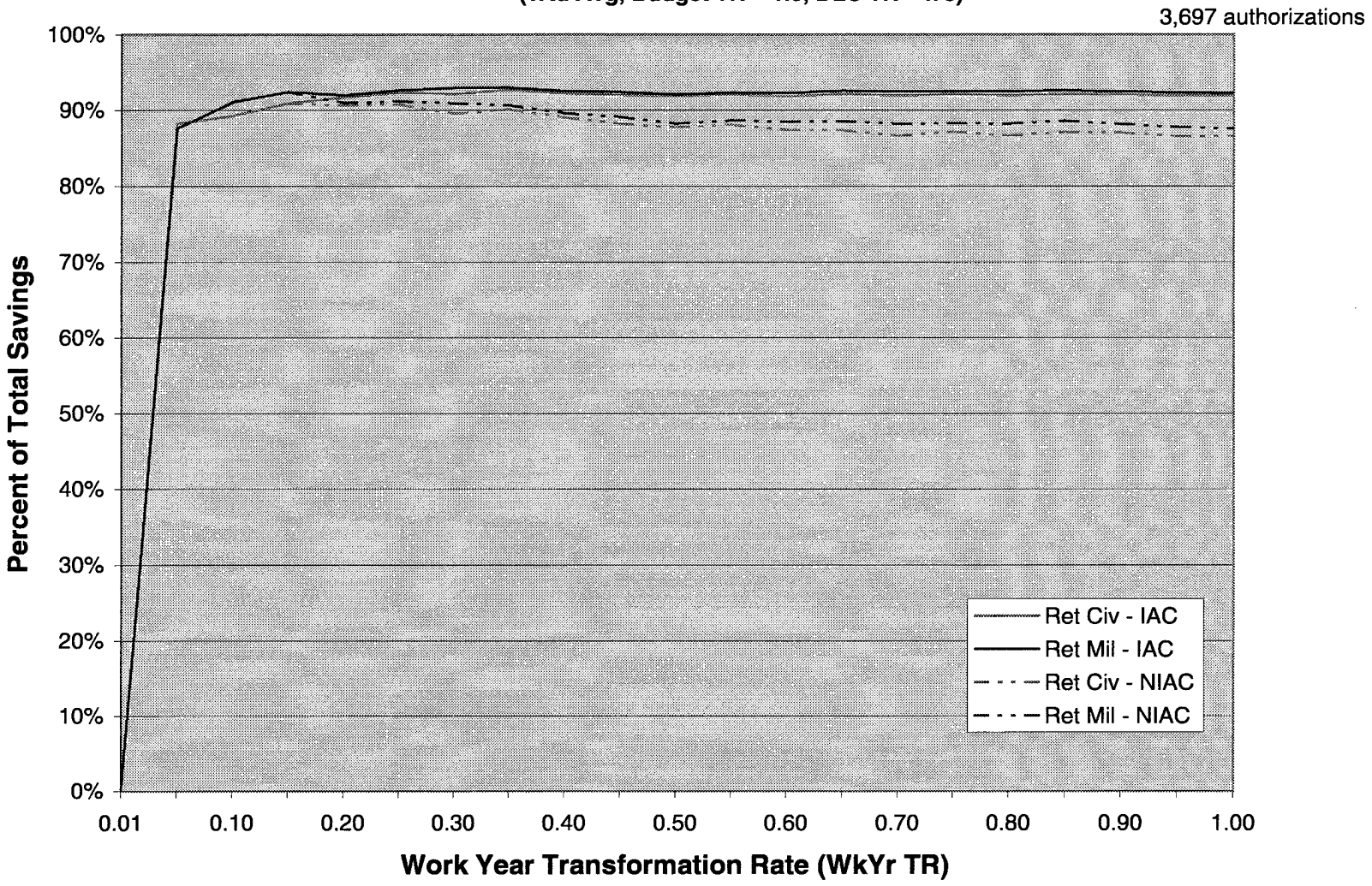
## Figure 4-3A - Percent of Total Savings Attributable to DLC Savings for CA 15 (Fire Protection)

**(Wtd Avg, Budget TR = 1.0, DLC TR = .75)**



## Figure 4-3B - Percent of Total Savings Attributable to DLC Savings for Combination 15

**(Wtd Avg, Budget TR = 1.0, DLC TR = .75)**



### 4.2.3 No Consistent Relationship Between MEO Size and OHR

For MEO's that are large enough to reduce support organization manning, there is no consistent relationship between a CA's MEO size and its OHR.[8] Figure 4-4 illustrates this. All 45 CA's MEOs are represented on the x-axis, from the largest (Combination 1) on the far left (i.e., 1) to the smallest (Entomology) on the far right (i.e., 45). Table 4-3 also lists all MEOs in rank order by size, along with their sizes, base-case OHRs, and precompetitive DLCs and personnel authorizations. For the purposes of this explanation, Figure 4-4 and Table 4-3 will be separated into three regions based on the predominant trend of OHRs. Region 1 includes the 19 largest CAs, region 2 includes from the 20$^{th}$ largest to the 29$^{th}$ largest, and region 3 includes the rest (i.e., the 30$^{th}$ largest to the smallest).

Region 1 includes MEOs with populations from 4,116 (Combination 1) to 139 (Combination 8). Clearly, there is no consistent linear relationship between MEO size and OHR.[9] To confirm the apparent lack of relationship between MEO size and OHR for MEOs in this region, a linear regression of OHR on MEO size was performed. The resulting equation had an $R^2$ of .12, confirming the preliminary observation that MEO size is a poor predictor of its OHR.

MEOs in region 2 have unusually high OHRs, but they don't provide any evidence of a relationship between MEO size and OHR, either. The populations of MEO 20, 21, and 22 are 117, 104, and 79, respectively, while their OHRs of 3.69, 4.03, and 3.98 don't follow a similar pattern. Likewise, the sizes and OHRs of MEOs 26 through 29 don't follow a consistent pattern.

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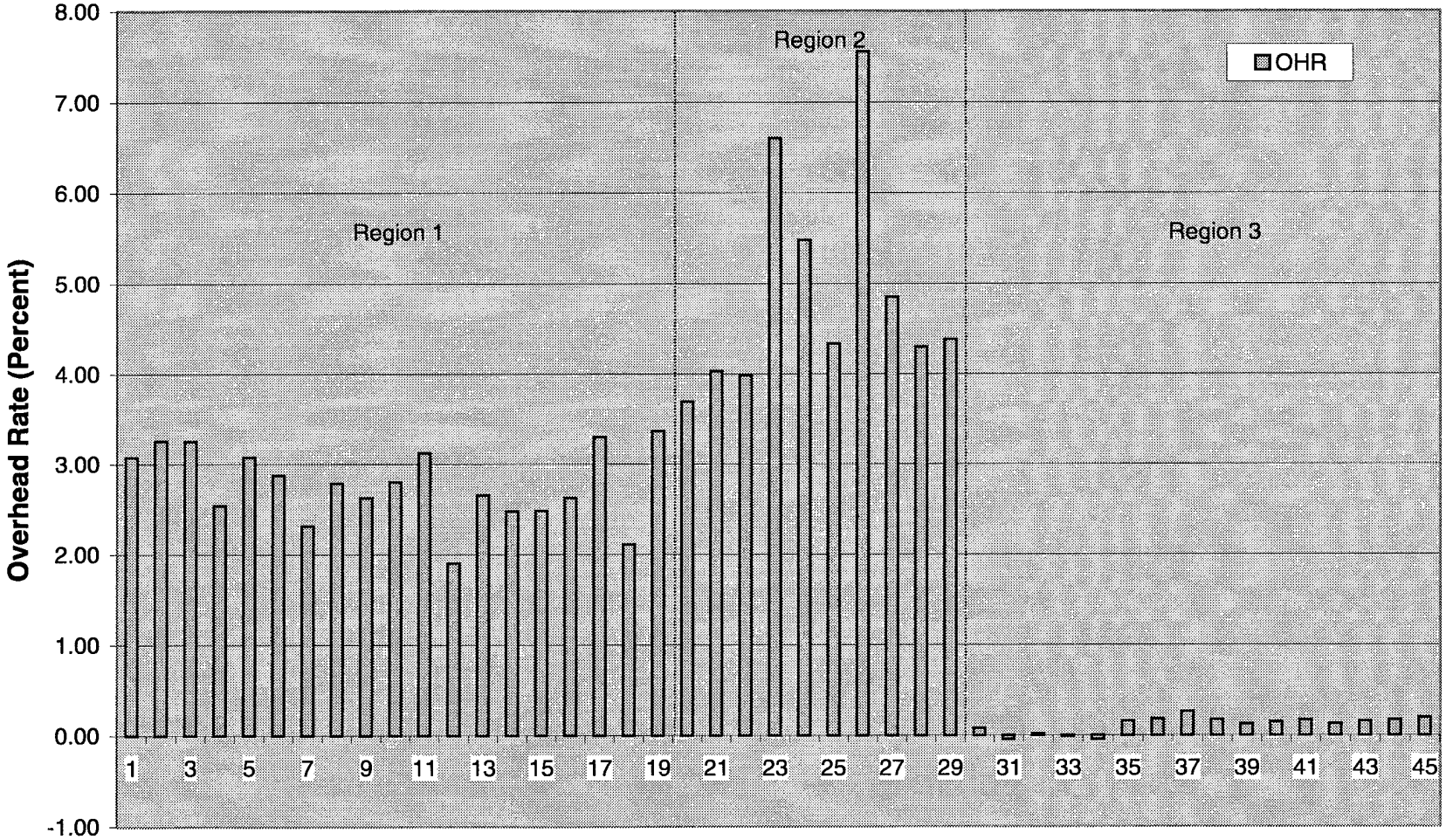
[8] For all practical purposes, the OHR for MEO's not large enough to reduce support organization manning will always be zero. Since approximately 90 percent of overhead savings are due to reductions in support organization labor, small MEO's which don't affect support organization authorizations produce very little overhead savings which, in turn, results in a very low OHR.

[9] Whereas it appears there could be a slight downward trend in OHR as the MEOs get smaller, it should be realized that Figure 4-4 orders MEOs by *rank* of size, not size. So while the difference in size between the first and second MEOs is 1,343 (i.e., 4,116 – 2,773), the difference in size between the 18$^{th}$ and 19$^{th}$ is 2 (i.e., 141 – 139).

## Figure 4-4 - Overhead Rates of Commercial Activities By Rank of MEO Size

**Base Case Algorithm**



# Table 4-3 – MEO Results, By MEO Size

| Commercial Activity | MEO | | Base Case OHR (Percent) | | DLC | | Precompetitive Personnel Populations | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Rank | Size | Rank | Rate | Rank | DLC | Total | Off | Enl | Civ |
| Combo 1 | 1 | 4,116 | 17 | 3.07 | 1 | 266,410,410 | 5,485 | 600 | 4,032 | 853 |
| Combo 15 | 2 | 2,773 | 13 | 3.26 | 2 | 165,138,658 | 3,697 | 71 | 2,996 | 630 |
| Combo 7 | 3 | 1,677 | 14 | 3.25 | 4 | 98,087,440 | 2,235 | 37 | 1,936 | 262 |
| 60th Medical Group (Combo 6) | 4 | 1,341 | 24 | 2.54 | 3 | 101,271,753 | 1,788 | 529 | 1,036 | 223 |
| 60th Aircraft Generation Squadron | 5 | 465 | 16 | 3.08 | 7 | 28,184,336 | 620 | 8 | 571 | 41 |
| Combo 14 | 5 | 465 | 18 | 2.87 | 6 | 29,410,812 | 620 | 33 | 469 | 118 |
| Medical Operations Squadron | 7 | 408 | 27 | 2.31 | 5 | 31,996,925 | 543 | 210 | 271 | 62 |
| Civil Engineering (Combo 3) | 8 | 369 | 20 | 2.79 | 8 | 23,646,113 | 492 | 12 | 324 | 156 |
| Aerial Port Squadron | 9 | 312 | 23 | 2.62 | 11 | 18,338,876 | 415 | 7 | 307 | 101 |
| Combo 9 | 9 | 312 | 19 | 2.80 | 10 | 20,086,797 | 416 | 30 | 308 | 78 |
| Supply Squadron (Combo 2) | 11 | 290 | 15 | 3.12 | 14 | 16,430,696 | 386 | 6 | 315 | 65 |
| Surgical Operations Squadron | 12 | 285 | 29 | 1.90 | 9 | 22,693,806 | 379 | 167 | 194 | 18 |
| 660th Aircraft Generation Squadron | 13 | 281 | 21 | 2.66 | 15 | 16,248,624 | 374 | 5 | 369 | 0 |
| 60th Equipment Maintenance Sqdn | 14 | 270 | 26 | 2.48 | 12 | 17,098,003 | 360 | 6 | 282 | 72 |
| Diagnostics and Therapeutics Sqdn | 15 | 252 | 25 | 2.48 | 13 | 17,019,908 | 336 | 46 | 234 | 56 |
| 60th Component Repair Squadron | 16 | 175 | 22 | 2.63 | 16 | 10,607,336 | 233 | 3 | 198 | 32 |
| Security Forces Squadron | 17 | 152 | 12 | 3.30 | 18 | 8,367,774 | 202 | 3 | 197 | 2 |
| Communications Sqdn (Combo 4) | 18 | 141 | 28 | 2.11 | 17 | 8,996,033 | 188 | 9 | 153 | 26 |
| Combo 8 | 19 | 139 | 11 | 3.37 | 19 | 7,836,179 | 185 | 2 | 125 | 58 |
| Services Squadron (Combo 5) | 20 | 117 | 10 | 3.69 | 20 | 7,182,735 | 156 | 3 | 75 | 78 |
| Transportation Squadron | 21 | 104 | 8 | 4.03 | 22 | 6,351,729 | 138 | 2 | 102 | 34 |
| Dental Squadron | 22 | 79 | 9 | 3.98 | 21 | 6,400,729 | 105 | 26 | 73 | 6 |
| Fuels Management | 23 | 69 | 2 | 6.60 | 24 | 3,879,375 | 92 | 1 | 82 | 9 |
| 60th Logistics Support Squadron | 23 | 69 | 3 | 5.48 | 23 | 4,673,631 | 91 | 3 | 77 | 11 |
| Combo 10 | 23 | 69 | 6 | 4.33 | 25 | 3,694,330 | 92 | 0 | 27 | 65 |
| Fire Protection | 26 | 62 | 1 | 7.55 | 26 | 3,338,010 | 82 | 0 | 71 | 11 |
| Child Development Centers | 27 | 31 | 4 | 4.85 | 29 | 1,556,441 | 41 | 0 | 0 | 41 |
| Combo 11 | 27 | 31 | 7 | 4.30 | 27 | 1,757,645 | 41 | 0 | 41 | 0 |
| Base Network Control | 29 | 27 | 5 | 4.38 | 28 | 1,716,611 | 36 | 1 | 32 | 3 |
| Combo 12 | 30 | 23 | 41 | 0.08 | 31 | 1,227,502 | 30 | 0 | 0 | 30 |
| Combo 13 | 31 | 22 | 44 | -0.04 | 30 | 1,241,195 | 29 | 0 | 29 | 0 |
| Telecommunications Center | 32 | 15 | 42 | 0.01 | 32 | 787,217 | 19 | 0 | 19 | 0 |
| CE Material Acquisition | 33 | 12 | 43 | -0.01 | 33 | 683,752 | 16 | 0 | 11 | 5 |
| Fitness Center | 34 | 11 | 45 | -0.04 | 35 | 581,634 | 14 | 0 | 12 | 2 |
| Housing Management | 35 | 10 | 36 | 0.16 | 34 | 586,531 | 13 | 0 | 0 | 13 |
| Ground Radio Maintenance | 36 | 9 | 32 | 0.18 | 37 | 516,450 | 12 | 0 | 12 | 0 |
| Telephone Operations (Switchboard) | 36 | 9 | 30 | 0.26 | 40 | 352,816 | 12 | 0 | 0 | 12 |
| Individual Equipment Element | 38 | 8 | 33 | 0.17 | 38 | 428,138 | 10 | 0 | 8 | 2 |
| Education Services | 39 | 7 | 40 | 0.12 | 36 | 519,687 | 9 | 0 | 4 | 5 |
| Port Mortuary | 40 | 6 | 38 | 0.14 | 39 | 383,063 | 7 | 0 | 3 | 4 |
| Hazardous Materials | 41 | 5 | 35 | 0.16 | 42 | 278,931 | 6 | 0 | 5 | 1 |
| Heating Plant (Heat/Steam Ops) | 42 | 4 | 39 | 0.13 | 41 | 288,154 | 5 | 0 | 0 | 5 |
| ATCALS Maintenance | 42 | 4 | 37 | 0.15 | 43 | 238,610 | 5 | 0 | 5 | 0 |
| METNAV Maintenance | 42 | 4 | 34 | 0.17 | 44 | 215,368 | 5 | 0 | 5 | 0 |
| Entomology | 45 | 3 | 31 | 0.19 | 45 | 143,121 | 3 | 0 | 2 | 1 |

Some insight into the implications of the OHR equation (i.e., OHR = ΔOHC / $DLC_{MEO}$) and the reason there is no consistent relationship between MEO size and OHRs is provided by MEOs 23, 24, and 25 (i.e., Fuels Management, 60th Logistics Support Squadron, and Combination 10, respectively). Clearly, a larger MEO size is more likely to produce larger reductions in support organization authorizations which, in turn, will increase the change in OHC (i.e., the numerator in the equation). If all authorizations incurred the same DLC, then the OHR would be somewhat predictable because, on average, support organization authorizations (and associated support organization DLCs) are eliminated at a somewhat predictable rate.[10] The OHR would decrease as the MEO size increased until the MEO size crossed a threshhold where an additional support organization authorization is eliminated, at which point the OHR will suddenly increase, then repeat the pattern.[11] The result would be more predictable OHRs, especially for larger organizations where OHRs are not significantly affected by a decrease of one support organization authorization. However, all authorizations don't incur the same DLCs. MEOs 23, 24, and 25 all have 69 authorizations, but have significantly different OHRs (i.e., over one percent difference between each). The difference between OHRs for MEOs 23 and 24 can be totally explained by the difference between their DLCs. Overhead savings for both were approximately $192,000, but DLCs were $2,909,531 and $3,505,223 for MEOs 23 and 24,[12] respectively. The higher DLCs for MEO 24 indicate a higher rank structure than in MEO 23.

The difference in OHRs between MEO 24 and 25, however, cannot be explained by the difference between their DLCs. In fact, MEO 24 has a significantly higher DLC than MEO 25 ($3,505,223 for MEO 24 vs. $2,770,748 for MEO 25). If overhead savings were similar, that would produce a lower OHR. However, that is not the case. The lower OHR for MEO 25 is explained by the precompetitive organization's manpower composition. MEO 24's precompetitive organization has 80 military and 11 civilian authorizations; MEO 25's has 27

[10] The BST factor discussed in section 5.1 is an estimate of the rate at which support organization authorizations are eliminated.

[11] Since 90 percent of overhead savings are due to DLC reductions, ΔOHC essentially remains constant while $DLC_{MEO}$ increases with MEO size. The result will be a decreasing OHR until a support organization authorization is eliminated, at which point the ΔOHC suddenly increases, causing a jump in the OHR.

[12] The DLCs in Table 4-3 are for the MEO's precompetitive organization. To obtain MEO DLCs, multiply the precompetitive DLCs by the DLC TR of .75 (i.e., $3,879,375 x .75 = 2,909,531, and $4,673,631 x .75 = 3,505,223).

military and 65 civilian authorizations. When the precompetitive organizations are converted into MEOs, MEO 24's civilian population (and, therefore, the base's civilian population) increases by 58, while MEO 25's only increases by four. An increase of 58 is enough to add one authorization to the Civilian Personnel Office, but an increase of four isn't. The result is that while MEO 24's DLCs are 21 percent higher than MEO 25's, a change that, when taken alone, would increase the OHR, its change in OHCs was 39 percent larger than MEO 25's, a change that swamps the effect of the higher DLCs and decreases the OHR by an even greater amount. This can be seen by looking at the OHRs not including avoided costs. MEO 25's OHR is the same including and not including avoided costs, but both MEO 23 and 24's are significantly lower not including avoided costs. That indicates MEOs 23 and 24 have military populations large enough to increase the Civilian Personnel Office's authorizations while MEO 25 doesn't.

Region 3 also yields no apparent relationship between MEO size and OHR. These MEOs are too small to affect support organization manning, so their OHRs are close to zero regardless of their size.

#### 4.2.3.1 A Small CA's OHR Can Be Sensitive to Base Population

A small CA's OHR can be sensitive to the current base population. Looking at the smallest CA in region 2 (i.e., MEO 29 [Base Network Control] with a precompetitive size of 36 authorizations and a base-case OHR of 4.38 percent) and the largest CA in region 3 (i.e., MEO 30 [Combination 12] with a precompetitive size of 30 authorizations and a base-case OHR of 0.08 percent), it is clear that significant differences in OHRs can occur with small changes in MEO size.[13] The reason is that a support organization's AFMS threshhold was crossed as the base's population was reduced the additional six authorizations. This resulted in a support organization authorization being eliminated which produced the sudden, large increase in overhead savings causing the much higher OHR. Since 16 of the CAs in this study had 30 or fewer authorizations, their OHRs were essentially zero percent. If the base population were 20 authorizations lower than the base population used in this study, some of the small CAs would

[13] Since the base-case OHR assumes a WkYr TR = .75, the sizes of MEO 29 (Base Network Control) and MEO 30 (Combination 12) are 27 and 23 authorizations, respectively.

have caused a support organization authorization to be eliminated and, consequently, would have significantly higher OHRs than those presented here. Conversely, if the base population were 10 authorizations larger than the base population used in this study, perhaps a few more CAs would not have caused a support organization authorization to be eliminated and, as a result, might have OHRs close to zero.[14] However, since support organization authorizations are eliminated at a fairly consistent rate (see discussion of Base Support Tail factor in section 5.1), as an increasing number of authorizations are outsourced, the OHR will converge on results similar to those presented for large CAs. This can be seen in region 1 where, while there is variation in OHRs, most of them (15 of the 19) fall between 2.25 and 3.25 percent.

From a policy perspective, this does *not* mean the results produced by this research are peculiar to a specific base population and, therefore, cannot be generalized. It merely points out that all bases will have three regions of CAs: one where MEO sizes and, therefore DLCs, are high enough to render OHRs insensitive to an additional support organization authorization being eliminated (i.e., region 1); one where MEOs are large enough to cause support organization authorizations to be eliminated, but whose DLCs are low enough to cause the OHR to change significantly when an AFMS threshhold is crossed causing another support organization authorization to be eliminated (i.e., region 2); and one where OHRs are essentially zero because MEOs are too small to cause a support organization to lose an authorization (i.e., region 3). The cutoff for the CAs' precompetitive populations may be a bit higher or lower with other base populations than the cutoffs identified in this research, but OHR behavior will be similar in each of the regions as was presented in this research.

The lesson is that, in general, OHRs of CAs smaller than approximately 100 authorizations are more sensitive to the current base population and, therefore, are more volatile than OHRs of larger CAs. Consequently, if only one CA is being competed, then using that particular CA's OHR for developing the MEO bid would be appropriate. However, if many CAs (i.e., many authorizations) are going to be competed for outsourcing over the coming years, using an OHR closer to that of larger CAs (i.e., > 100 authorizations) would be more appropriate.

[14] Since different AFMSs have different workload factors, the composition of the 20 fewer or 10 additional authorizations would affect whether support organization authorizations are eliminated. Therefore, it cannot be said conclusively that a CA's OHR would change significantly without being more specific about the types of authorizations they are (e.g., officer, enlisted, civilian) and the organizations from which they were taken or added.

### 4.2.4 The Manpower Composition of the Precompetitive CA Alone is Not Predictive

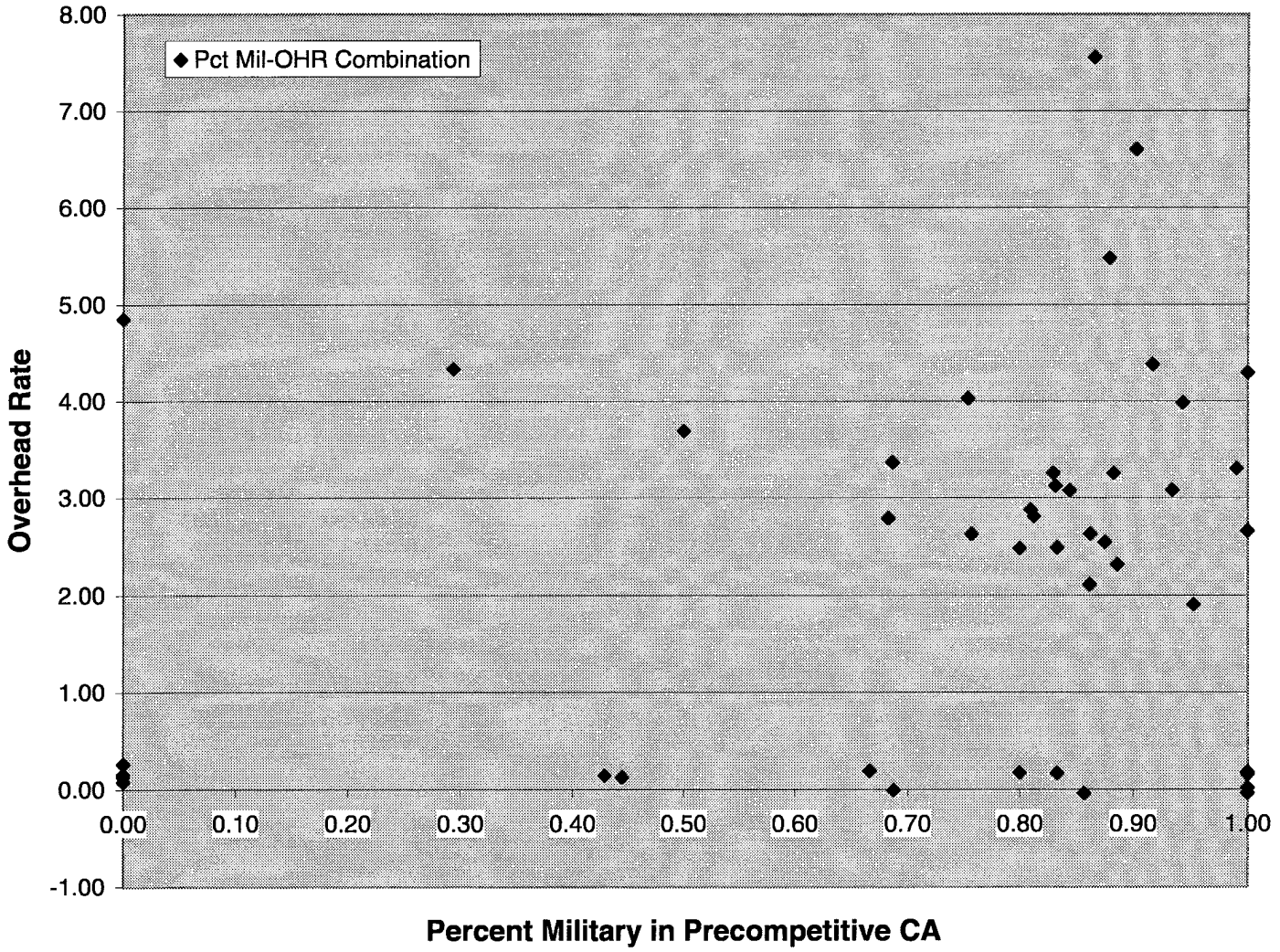
As was discussed in section 4.2.3, a CA's precompetitive manpower composition can significantly affect a CA's OHR. To test an hypothesis that predominantly military precompetitive CAs would have higher OHRs than predominantly civilian precompetitive CAs,[15] an analysis was performed to determine the relationship between the manning composition (i.e., military vs. civilian) of a precompetitive CA and its OHR. There appears to be no relationship between a precompetitive CA's composition of manpower and its OHR. Figure 4-5 is a scatterplot showing all Percent Military-OHR combinations. Whereas there is a cluster of CAs with precompetitive military manning percentages between 80 and 100 percent, their OHRs cover a large range from –0.04 to 7.55 percent (i.e., from the minimum to the maximum OHR for all 45 CAs). To confirm the apparent lack of relationship, linear regressions of OHR on precompetitive military manning percentage were performed. Regressions run included: (1) all CAs, (2) CAs large enough to produce a change in support organization authorizations, and (3) CAs large enough to increase the number of Civilian Personnel Office authorizations. The resulting equations all had an adjusted $R^2$ below .05, indicating there is essentially no relationship between the precompetitive military manning percentage of a CA and its OHR. The reason is that for a CA to cause an increase in Civilian Personnel Office authorizations, its MEO will generally be large enough to have relatively high DLCs, which renders its OHR fairly insensitive to the additional authorizations in the Civilian Personnel Office.

### 4.2.5 The Ret Civ Algorithm Generally Results in Higher OHRs

The Ret Civ algorithm usually results in a higher OHR than the Ret Mil algorithm, regardless of the DLC elimination algorithm used. That is, eliminating military authorizations produces higher

[15] The reasoning behind the hypothesis was that predominantly military organizations would produce larger increases in the base's civilian population when converted into an MEO which, in turn, would be more likely to increase the size of the Civilian Personnel Office. The increased DLCs incurred by the additional authorizations in the Civilian Personnel Office would increase the DLCs eliminated if the CA were outsourced. The result would be a higher OHR.

## Figure 4-5 - Effect of Precompetitive CA's Manpower Composition on OHR



savings than eliminating civilian authorizations. Table 4-4 summarizes the results. For each CA, the OHRs produced by both retention algorithms (i.e., Ret Civ, Ret Mil) for all 21 WkYr TRs were compared. If the OHR produced by one algorithm (e.g., Ret Civ) for each of the 21 WkYr TRs (from .01 to 1.0) was greater than or equal to the OHR produced by the other algorithm (e.g., Ret Mil), then the first algorithm "dominates" the second algorithm.[16] If the OHR produced by one algorithm was greater than or equal to the OHR produced by the other algorithm for 17 to 20 WkYr TRs, then the algorithm is predominant for greater than 80 percent of the WkYr TRs (> 80%). And if the OHR produced by one algorithm was greater than or equal to the OHR produced by the other algorithm for 11 to 16 WkYr TRs, then the algorithm is predominant for between 50 and 80 percent of the WkYr TRs (50-80%).

**Table 4-4 - Effect of Retention Algorithm on OHR**

| Level of Predominance | Wtd Avg* | | Lo | | Hi | |
|---|---|---|---|---|---|---|
| | Ret Civ | Ret Mil | Ret Civ | Ret Mil | Ret Civ | Ret Mil |
| Dominates (100%) | 30 | 0 | 30 | 0 | 33 | 0 |
| > 80% | 4 | 7 | 3 | 7 | 11 | 0 |
| 50-80% | 1 | 4 | 2 | 3 | 1 | 0 |

*The sum of OHR functions add up to 46 (one more than the number of CAs) because one CA (Combination 1) has Almost an equal number of OHRs that are higher for the Ret Civ algorithm as for the Ret Mil algorithm (8 vs. 9). Since "ties" (4) are included in both algorithms' total number of higher OHRs, both algorithms OHR functions Predominate for over 50 percent of the WkYr TRs.

As Table 4-4 indicates, the Ret Civ algorithm dominates the Ret Mil algorithm for 30 CAs (i.e., 67 percent of the CAs) if either the Wtd Avg or Lo DLC elimination algorithms are used, and for 33 CAs if the Hi DLC elimination algorithm is used. For CAs that are not dominated by the Ret Civ algorithm, the Ret Mil algorithm produces higher OHRs for more WkYr TRs than

[16] Note that the criteria is "greater than or equal to." Theoretically, since "ties" (i.e., WkYr TRs where both algorithms produce the same OHR) are included in both algorithms' total number of higher OHRs, it is possible for both algorithms to "dominate" the other if both algorithms produce identical OHRs for all 21 WkYr TRs. In this study, where OHRs were calculated to two significant decimal places (i.e., to the 100ths of a percent), ties were not common.

the Ret Civ algorithm if either the Wtd Avg or Lo DLC elimination algorithms are used.[17] If the Hi DLC elimination algorithm is used, the Ret Civ algorithm produces higher OHRs for more WkYr TRs than the Ret Mil algorithm for all 45 CAs.

### 4.2.6 Combining Related CAs Doesn't Significantly Affect OHRs

In addition to size and composition effects, there is an "organizational" effect that produces overhead savings. The "organizational" factors that produce overhead savings are: (1) crossing the threshhold of an AFMS that is based on a particular organization's population (i.e., rather than the base's population),[18] and (2) outsourcing large MEOs (i.e., > 150 authorizations). An example of the first can be illustrated using a group commander's support staff. The AFMS directed manpower requirement for a group commander's support staff is:

$$\text{If Grp Pop} \leq 1{,}350 \text{ Then } Y = 5 \text{ Else } Y = 6$$

where Grp Pop = the group's population, and Y = the number of authorizations in the group commander's support staff.[19] Obviously, if enough CAs within a particular group are outsourced (i.e., if enough authorizations within a single group are eliminated), the group's population will fall below 1,350 causing one SSgt authorization to be eliminated from the group commander's support staff which otherwise would not be eliminated if the CAs outsourced (i.e., authorizations eliminated) were spread across multiple groups. Unlike most AFMSs, which implement a size effect, this type of AFMS implements an "organizational" effect.

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[17] This is not necessarily the same as saying the Ret Civ algorithm has a higher probability of resulting in a higher OHR than the Ret Mil algorithm. Because the probabilities of each WkYr TR occurring for a particular CA are not known, concluding that one algorithm has a higher probability of resulting in a higher OHR is not possible unless one algorithm dominates the other. For example, one algorithm can produce higher OHRs for 20 of the 21 WkYr TRs, but if the probability of a CA experiencing the 21st WkYr TR when it is converted into an MEO is 1.0, then the algorithm that produces the highest OHR for that WkYr TR has the highest probability of resulting in a higher OHR.

[18] All group and squadron command sections, as well as the Management Analysis Flight in the Contracting Squadron, are authorized manpower based on populations smaller than the base's. The AFMSs describing their manpower requirements are 10X0, XXX0, and 12A0, respectively.

[19] AFMS 10X0, *Group Commander's Support Staff*, paragraphs 4.1-4.2. The sixth authorization is for a SSgt.

The second factor that produces an organizational effect is the number of CAs outsourced which, in turn, affects the number of contract administrators required. In general, as MEO size grows, the average ratio of contract-administrators to MEO-authorizations-outsourced falls.[20] The result is that, on average, many small MEOs with the same number of authorizations as one large MEO will require more contract administrators. Since each contract administrator incurs approximately the same overhead costs (e.g., office supplies, PC, electricity, water), more contract administrators incur more overhead costs and, therefore, reduce overhead savings.[21] Consequently, all else being equal, outsourcing fewer, larger MEOs would produce higher overhead savings than outsourcing many smaller MEOs with the same total number of authorizations.

To determine if these organizational effects are significant, two types of analyses were performed. The first analysis compared the OHR of a single CA to the OHR of an equally-sized combination of (usually unrelated) CAs. The second analysis compared the OHRs of combinations of CAs with the OHRs of the individual CAs that make up the combinations. The concept behind these analyses is that if these effects are significant, then the OHRs for individual CAs and combinations of related CAs should be higher than OHRs for similarly-sized combinations of unrelated CAs. The results don't indicate that this is the case.

Table 4-5 lists four CA/combination pairs. The CA and combination in each pair have the same (or, in the case of the third pair, close to the same) number of authorizations. The first three pairs include a combination of unrelated CAs, the fourth includes a combination of related CAs (i.e., all CAs in the fourth combination are in the Communications Squadron). Results indicate that there is no consistent pattern of OHRs with respect to organizational characteristics. In three of the four pairs, the single CA has a higher OHR than the combination, including the fourth pair where the combination consists of related CAs. Also in three of the four pairs, the single CA has a higher maximum OHR than the combination, but not the same three as those that

[20] The range is from a high of approximately 5 percent of MEO size for MEOs less than 21 authorizations, to 4 percent for MEOs between 21 and 150 authorizations, dropping gradually to 3 percent for MEOs with 300 authorizations, and leveling off at 2.5 percent for MEOs with greater than 450 authorizations. Table A-3 in Appendix A describes contractor administration requirements.

[21] Recall that contract administrator DLCs are not included in the computation of overhead savings because they are included in the price of the contract. See section 3.3.5 for further explanation.

have higher OHRs. In addition, an in-depth analysis reveals that over 98 percent of the differences in OHRs between the single CA and its matched combination can be explained by the difference in manpower compositions and/or the difference in DLCs (i.e., rank structures).[22]

**Table 4-5 – Comparison of Outsourcing One CA vs. Multiple CAs**
**(Wtd Avg, DLC TR = .75)**

| CA/Combination Pair | # of Auths | DLC | OHR (%) (WkYr TR=.75) | Max OHR |
|---|---|---|---|---|
| CA 1 - Fuels Management | 92 | 3,879,375 | 6.60 | 6.79 |
| Combination 10 – Unrelated Cas | 92 | 3,694,330 | 4.33 | 4.53 |
| CA 5 - 60th Aircraft Generation Sqdn | 620 | 28,184,336 | 3.08 | 4.47 |
| Combination 14 – Unrelated Cas | 620 | 29,410,812 | 2.87 | 3.90 |
| CA 10 - Aerial Port Sqdn | 415 | 18,338,876 | 2.62 | 4.93 |
| Combination 9 – Unrelated Cas | 416 | 20,086,797 | 2.80 | 3.78 |
| CA 25 - Child Development Center | 41 | 1,556,441 | 4.85 | 5.11 |
| Combination 11 - All CAs in Communication Sqdn | 41 | 1,757,645 | 4.30 | 14.51 |

Table 4-6 lists six combinations of related CAs along with their OHRs and maximum OHRs. It also has OHRs and maximum OHRs for the component CAs that make up the combinations. Only component CAs that are large enough to cause a change in support organization authorizations (i.e., CAs with 35 or more authorizations) are included in the calculations for the Component CA OHR Information section. Including smaller CAs would skew the average OHRs downward giving the impression that component CAs have lower OHRs overall than the combinations of related CAs. The downward bias, however, is due to a size effect, not an organizational effect.

The first four combinations have only one component CA large enough to affect support organization authorizations. In all four cases, the component CA has a significantly higher OHR than the combination of related CAs. This is because the component CAs have between 36 and 156 authorizations which, given the current population of Travis AFB, is a range that has

[22] Differences in manpower compositions and/or DLCs can explain 99.54, 98.32, 98.91, and 100 percent of the differences in OHRs for pairs one through four, respectively.

unusually low DLCs with respect to the overhead savings they generate. (See section 4.2.3 for a discussion of CAs in region 2) The fifth and sixth combinations' OHRs are also lower than the average of their component CAs, but they are much more similar than the first four combinations' OHRs because most of the component CAs are larger than 156 authorizations. In addition, the maximum OHR for all six combinations is greater for at least one of the components than for the combination itself. These results indicate that there is no significant organizational effect on OHRs by combining related CAs.

**Table 4-6 – Comparison of Outsourcing Combinations vs. Component CAs**
**(Wtd Avg, DLC TR = .75)**

| Combination | # of Auths | DLC | OHR (%) (WkYr TR=.75) | Max OHR | Component CA OHR Info | |
|---|---|---|---|---|---|---|
| | | | | | Average | Max OHR |
| 2-Supply Squadron | 386 | 16,430,696 | 3.12 | 4.33 | 6.60 | 6.79 |
| 3-CE Squadron | 492 | 23,646,113 | 2.79 | 4.34 | 7.55 | 7.72 |
| 4-Communications Squadron | 188 | 8,996,033 | 2.11 | 4.10 | 4.38 | 4.59 |
| 5-Services Squadron | 156 | 7,182,735 | 3.69 | 4.91 | 4.85 | 5.11 |
| 6-Medical Group | 1,788 | 101,271,753 | 2.54 | 3.57 | 2.67 | 4.13 |
| 7-Log Grp, except Contracting Sqdn | 2,235 | 98,087,440 | 3.25 | 4.49 | 3.35 | 5.63 |

One reason the organizational effect doesn't significantly affect OHRs is that a large number of authorizations must be outsourced before an AFMS threshhold is crossed. At that point, eliminating one additional authorization only changes overhead savings by a small percentage. Another reason is that the estimate of overhead costs incurred by each contract administrator is less than $1,000 per year. Consequently, a few more or less contract administrators don't change overhead savings significantly, either.

In conclusion, while there may be additional overhead savings realized from outsourcing related CAs or large CAs, they are insignificant when compared to total savings and, therefore, won't change the OHR significantly. The additional savings are usually so small that they probably shouldn't override other considerations when selecting CAs to outsource.

## 4.3 Implications for Policy

Some implications of this study's findings for the Air Force are:

1. A new OHC estimating policy should be adopted,
2. AFMSs limit the potential for overhead savings,
3. Eliminating military authorizations (i.e., retaining civilian authorizations) generally reduces overhead costs more than eliminating civilian authorizations (i.e., retaining military authorizations),
4. Overhead savings should not be a significant factor in determining which activities should be competed,
5. Elaborate outsourcing schemes are not necessary (i.e., each activity competed should be evaluated on its own merits),
6. Contracts for outsourced support organizations should be designed so the Air Force can benefit from further outsourcing and reengineering efforts, and
7. "Price-outs"[23] should be performed after each competition.

*A new OHC estimating policy should be adopted.* Assuming the major goal of outsourcing is to reduce costs, the Air Force should adopt a new policy for estimating OHCs to be included in the MEO's bid in A-76 competitions. If it doesn't, the 12 percent rule will continue to alter outsourcing decisions and will result in *increased* costs to the Air Force for those activities that are not awarded to the low cost producer. One possible alternative policy could be to modify 12 percent to a lower percentage (e.g., the three percent rule). Another possible policy could be to change the allocation base from MEO DLCs to another, more predictive allocation base. A third alternative would be to estimate the OHR for each competition.

*AFMSs limit the potential for overhead savings.* Overhead savings are driven by reductions in support organization authorizations. Since AFMSs determine the rate at which support organizations lose authorizations, AFMSs also determine the rate at which overhead savings

[23] The term "price-out" refers to the process of applying an AFMS to an organization to determine its authorization requirement.

accrue. If AFMS equation slopes could be increased, support organizations would lose authorizations at a faster rate.[24] [ftnt] The implication of a steeper slope is that each person filling an authorization would be more productive. This may not be an unreasonable assumption for many of the AFMS equations. If technology (e.g., faster PCs, newer software, advances in communications [e.g., local area networks, electronic mail, videoconferencing]) increases productivity, it may be possible to update the many AFMS equations derived prior to 1995, and possibly some derived since.

Another alternative would be for Manpower Offices to interpret AFMS manpower requirements differently. Currently, fractional manpower requirements are rounded up (e.g., 6.1 manpower requirements are rounded up to 7). If the Manpower Offices were to round manpower requirements according to conventional methods (e.g., 6.0 to 6.49 will be rounded to 6, while 6.50 to 6.99 will be rounded to 7), support organization authorizations would be eliminated quicker, which would increase the rate at which overhead savings accrue, as well.

*Eliminating military authorizations (i.e., retaining civilian authorizations) generally reduces overhead costs more than eliminating civilian authorizations (i.e., retaining military authorizations).* Since military authorizations incur more overhead costs than civilian authorizations (i.e., military authorizations are a workload factor in more AFMSs than civilian authorizations and, when there is a distinction, generally have larger slopes), eliminating military authorizations from support organizations whenever an authorization is eliminated will cause other support organizations to lose additional authorizations quicker. Of course, there are other considerations besides overhead savings when deciding which authorizations to eliminate (e.g., mobility requirements), but if reducing costs is a concern, this is a good rule of thumb.

*Overhead savings should not be a significant factor in determining which activities to compete.* Since overhead savings are a small percentage of the MEO's DLCs (and a smaller percentage of the precompetitive CA's DLCs), activities should be chosen for competition based primarily on direct cost savings and other factors. This doesn't mean overhead savings should be ignored, just that they should be kept in context.

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[24] Increasing AFMS slopes would have to be accomplished in conjunction with decreasing AFMS intercepts. Otherwise, increasing slopes will have the unintended effect of increasing manpower requirements for any given base population.

*Elaborate outsourcing schemes are not necessary (i.e., each activity competed should be evaluated on its own merits).* From an overhead savings perspective, there are not significant synergies from outsourcing some combinations of CAs versus other combinations. Therefore, unless there are benefits from combining CAs from a direct cost perspective, each CA should be chosen for competition based on the benefits of competing it rather than synergistic overhead savings that would be realized by combining CAs (i.e., bundling).

*Contracts for outsourced support organizations should be designed so the Air Force can benefit from further outsourcing and reengineering efforts.* As discussed in section 3.3.9, support organizations are the source of overhead cost savings. Therefore, if they are outsourced via fixed price contracts, the potential savings from overhead sources will decrease. Support organization costs have a fixed portion (i.e., "open the door" costs) and a variable portion. This is evident for support organization DLCs by looking at AFMS equations. Each equation has an intercept (the fixed portion) and a slope (the variable portion). According to Kenneth D. Tuchman (Byrne 1996), CEO of Teletech, one reason to outsource BOS functions is to convert fixed costs to variable costs. If the Air Force hopes to decrease overhead costs by outsourcing or reengineering activities, it must design contracts for outsourced support organizations so that it shares the savings that result from reduced workloads for the contractor. This is consistent with DoD policy principles regarding outsourcing, as well.

*Price-outs should be performed after each competition.* As base populations fall, manpower requirements fall, as well. But authorizations are only eliminated (or added) when the Manpower Office performs a price-out (i.e., applies the AFMSs). Consequently, the sooner price-outs are performed when base population falls, the sooner authorizations will be eliminated, and the sooner overhead savings will be realized.

## 4.4 OHR Behavior

For the sake of describing OHR behavior, CAs can be categorized as large, medium, or small, based on their precompetitive number of personnel. CAs with over 500 authorizations are considered large, CAs with between 35 and 500 authorizations are medium, and CAs with less than 35 precompetitive authorizations are small. Figures 4-6A, 4-7A, and 4-8A illustrate the

three general patterns of OHR behavior. Appendix H contains information on how graphical results for additional CAs can be obtained. However, none of the graphs contain concepts not presented in this chapter.

### 4.4.1 Large CA OHR Behavior (Over 500 authorizations)

Figure 4-6A graphs the overhead rate for Combination 15 (all CAs outsourced, except the Medical Group). It includes sensitivity analyses for the retention and DLC elimination algorithms and the WkYr TR (i.e., 126 combinations of values), and is characteristic of OHR behavior for large CAs. The independent variable, WkYr TR, which determines the MEO's size in relation to the precompetitive CA's size, is measured along the x-axis. The MEO size for each value of WkYr TR is listed across the x-axis above the graph. The dependent variable, OHR, is measured along the y-axis. The range on the y-axis represents the range of OHRs estimated by all 126 combinations of values included in the sensitivity analyses. As was discussed in section 4.2.2, since labor accounts for approximately 90 percent of overhead savings, including sensitivity analysis for the Budget TR would change the OHR by approximately five percent of the reported value.[25] On the y-axis to the right of the graph, the Wtd Avg lines for both retention algorithms and the highest OHR line (i.e., usually Ret Civ-Hi, sometimes Ret Mil-Hi) are labeled with the dollar value of the line (i.e., total overhead savings) when WkYr TR = 1.0.[26] Since the y-axis is labeled proportionally, these dollar values should help the reader estimate the dollar values represented by OHRs elsewhere along the axis.

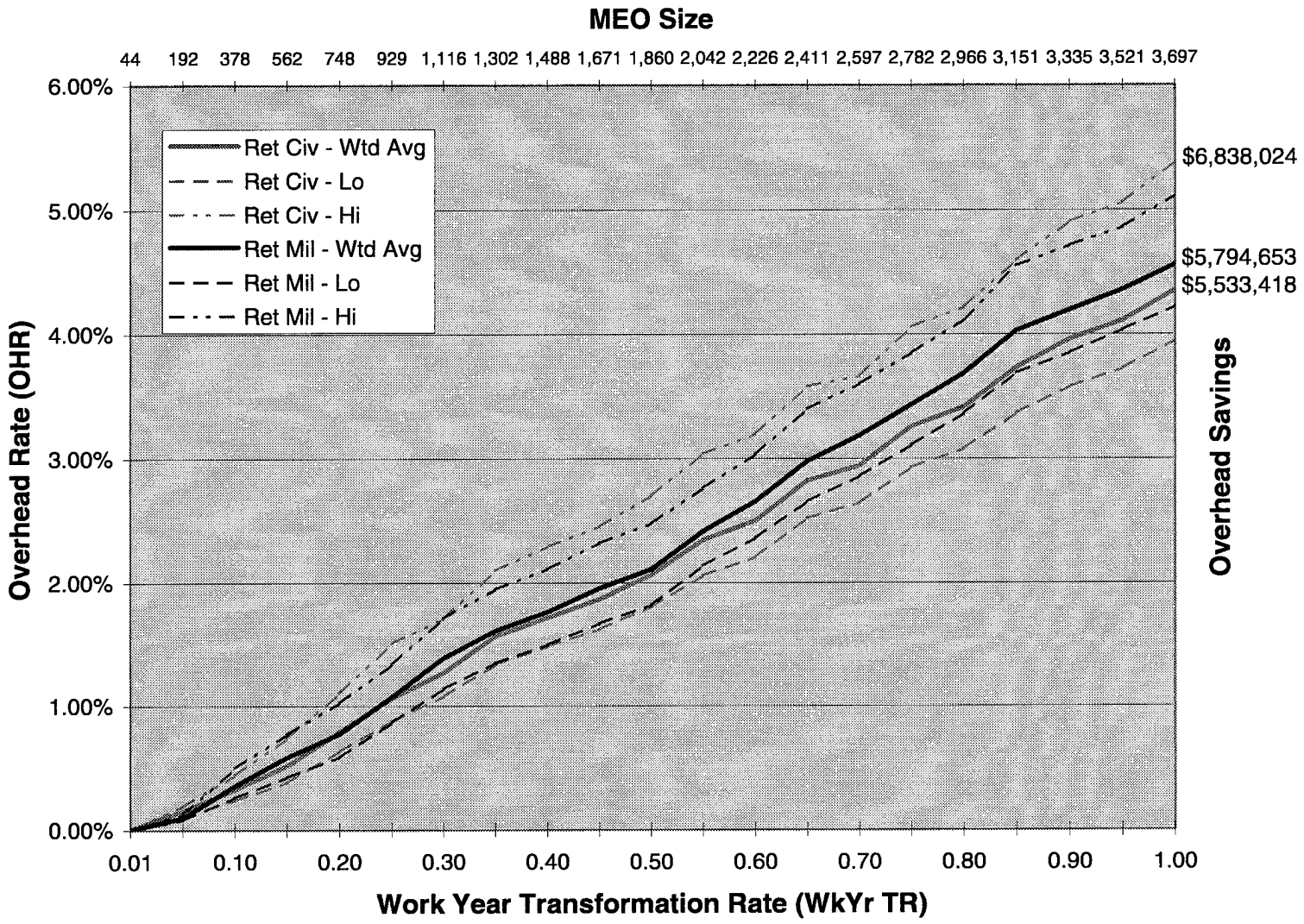
The retention algorithm (Ret Civ, Ret Mil) is represented by the color of the lines. The three lighter colored lines are for the Retain Civilian algorithm, the three darker colored lines are for the Retain Military algorithm. The DLC elimination algorithm (Wtd Avg, Hi, Lo) is represented by the style of the line (e.g., solid line, dotted line). The two bold continuous lines are for the Wtd Avg DLC elimination algorithm, the two uniformly dashed lines are for the Lo algorithm,

[25] For example, if the reported OHR is 3 percent, including sensitivity analysis for a Budget TR of .5 and 1.5 would result in OHR estimates of approximately 2.85 and 3.15 percent, respectively.

[26] For CAs with a precompetitive population greater than 35 (see section 4.4.3 for a discussion of CAs with less than 35 authorizations), this is usually where overhead savings and the OHR are at their maximum values, but not always. For the cases where they are not at their maximum values, they are very close to it.

## Figure 4-6A - Overhead Rates for Combination 15

**for WkYr TR between 0 and 1.0, Budget TR = 1.0, Including Avoided Costs**



and the two non-uniformly dashed lines are for the Hi algorithm. As expected, the Wtd Avg line is greater than or equal to the Lo line for all WkYr TRs and less than or equal to the Hi line for all WkYr TRs. In addition, the difference between the Ret Civ-Hi OHR function and the Ret Civ-Lo OHR function is generally larger than the difference between the Ret Mil-Hi OHR function and the Ret Mil-Lo OHR function (i.e., the range of OHRs produced by the Ret Civ algorithms is generally larger than the range of OHRs produced by the Ret Mil algorithms). This is because the range between the DLC incurred by the highest and lowest ranking military authorization in support organizations is larger, on average, than the range between the highest and lowest DLCs incurred by civilian authorizations. The Budget TR = 1.0 for all lines on the graph, and all lines include avoided costs.

For large CAs, the OHR increase is almost linear as the MEO size (as calculated by the WkYr TR) increases. A larger MEO means a larger number of authorizations will be eliminated from the base population if the CA is outsourced. The larger the reduction in base population, the larger the likelihood that support organization authorizations will be eliminated, which increases overhead savings. However, this graph should *not* be interpreted as conveying a relationship between MEO size and OHR (see section 4.2.3), but rather a relationship between MEO size and overhead savings. Recall the OHR equation: $OHR = \Delta OHC / DLC_{MEO}$.[27] The function represented in the graph varied the WkYr TR, but kept the DLC TR constant. Since the MEO size changed as the sensitivity analysis was performed on the WkYr TR, overhead savings changed as well. Since the $DLC_{MEO}$ remained constant, the line is upward sloping, giving the impression of a positive relationship between MEO size and OHR which does not exist. In reality, as MEO size changes, the $DLC_{MEO}$ would change with it. This method of graphing (i.e., keeping DLC constant) was chosen because: (1) it contains one less assumption (i.e., how $DLC_{MEO}$ varies with WkYr TR or MEO size), (2) the reader wouldn't have to disentangle the step functions in overhead savings from the step functions in $DLC_{MEO}$, and (3) as mentioned earlier, all OHRs can easily be transformed to accommodate other DLC TRs by multiplying by .75/x, where x is the alternate DLC TR. By looking at the OHR equation, it is clear that reducing

[27] Overhead Rate = (Change in Overhead Costs) / (the MEO's DLCs)

the DLC TR as the WkYr TR decreases would have the effect of increasing the intercept and reducing the slope of the line so it would be more horizontal than represented in the graph.[28]

The apparent lack of "steps" in the function is due to the large number of personnel in the precompetitive CA and, therefore, the large amount of $DLC_{MEO}$. The denominator in the OHR equation is so large that any change in overhead savings causes a small percentage change in the OHR. Figure 4-6B is the same graph as Figure 4-6A, except avoided costs are not included. The main difference is the lower overhead savings reduces the OHR for any given MEO size.

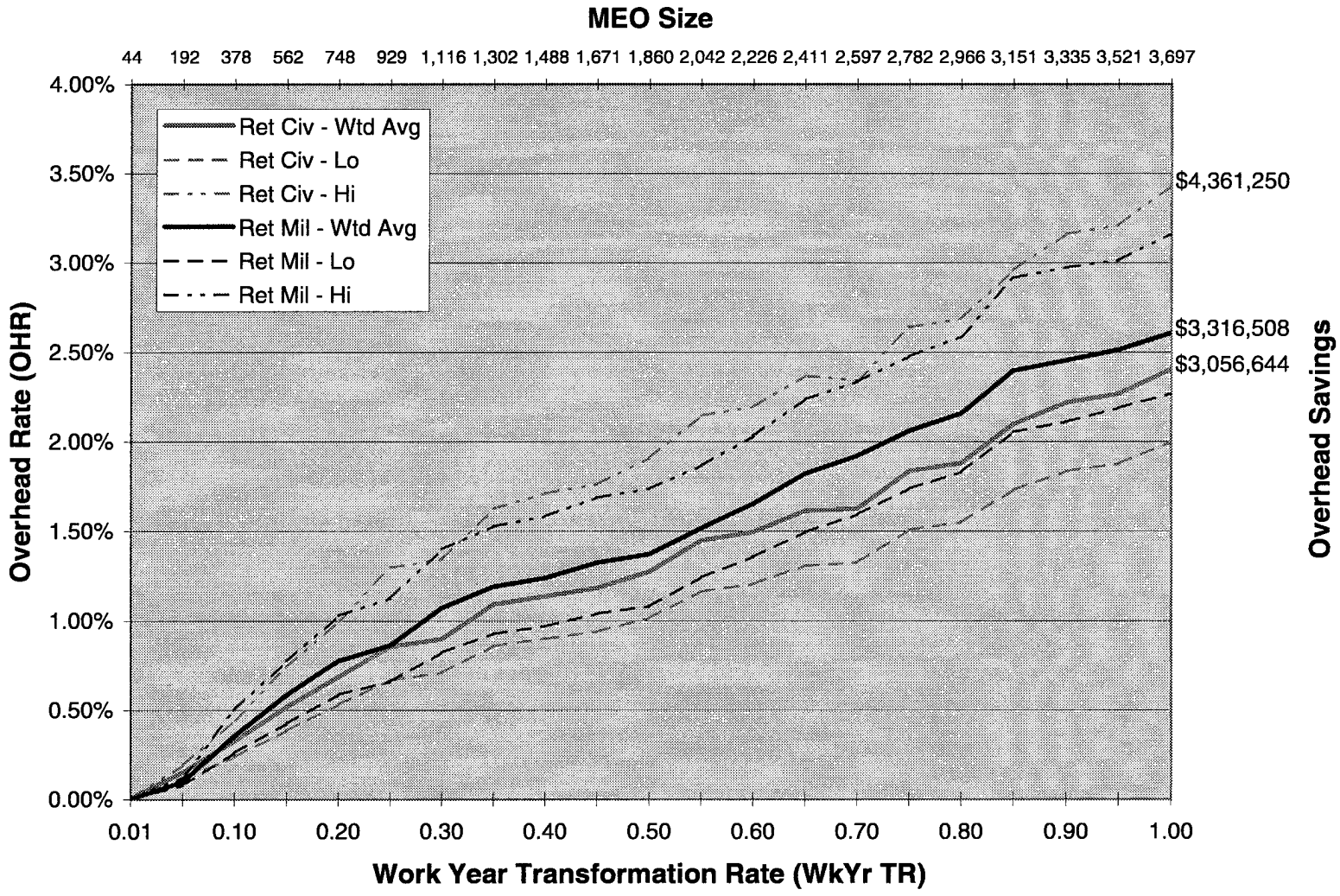
Figure 4-6C contains four bar graphs representing the share of overhead savings due to reductions in DLC versus reductions in budget requirements. It includes sensitivity analyses for retention algorithm and avoided costs. All graphs are for a WkYr TR = .75, the Wtd Avg DLC elimination algorithm, and a Budget TR = 1.0. Each bar is for a different Personnel Retained-Avoided Cost combination. The left two bars include avoided costs, the right two don't. The left-most bar in each pair are for the Retain Civilian retention algorithm, the right-most bars are for the Retain Military algorithm. The height of all bars is 100 percent since total savings is the sum of DLC savings and budget savings. The percent share of savings due to DLC reductions is represented by the bottom, darker portion of each bar and can be measured along the y-axis. The top, lighter portion of each bar represents the percent share of total savings due to budget reductions. The numbers within each shaded area are the absolute dollar savings that the shaded area represents. So if Combination 15 is outsourced and the Ret Civ algorithm (i.e., the left-most bar) is used for all support organizations, DLC reductions will be $3,811,860 including avoided costs, and budget reductions will be $326,872. DLC reductions will account for 92.1 percent of total savings (i.e., 3,811,860 / (3,811,860 + 326,872) = .921), and budget reductions will account for the remaining 7.9 percent (i.e., 326,872 / (3,811,860 + 326,872) = .079).

The difference between SIAC and SNIAC is greater for CAs with larger percentages of military personnel. Since the difference between these two numbers are all costs associated with new authorizations in the Civilian Personnel Office when the MEO is implemented, larger numbers of military personnel in the precompetitive CA will produce larger increases in the

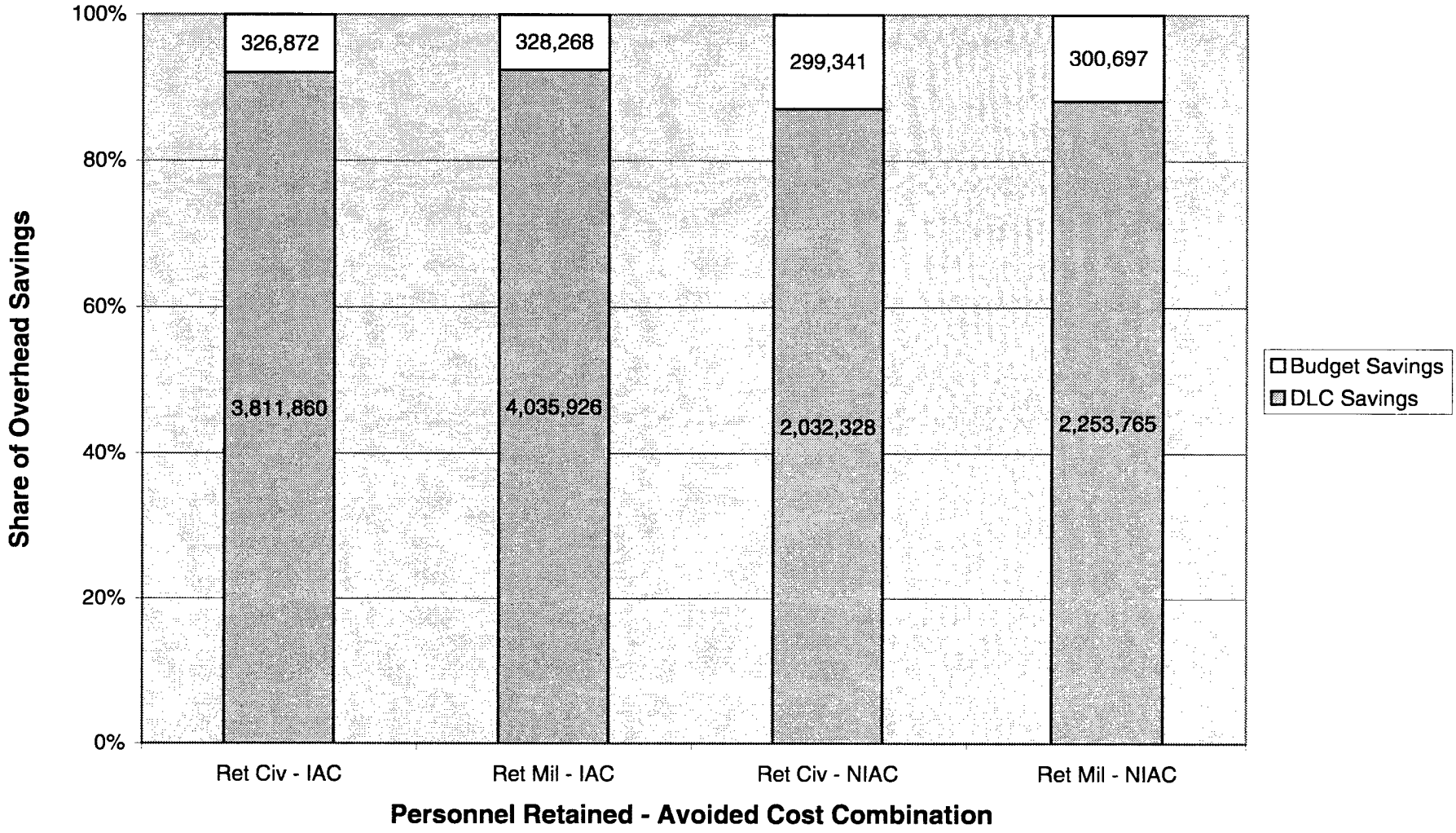
[28] To illustrate, the OHRs for Combination 15 at WkYr TRs of .25 and 1.0 are 1.07 and 4.35 percent, respectively. Assuming a constant relationship between WkYr TR and DLC TR (i.e., WkYr TR = DLC TR), then applying the .75/x equation to both WkYr TR OHRs yields OHRs of 3.21 (i.e., 1.07 x (.75 / .25)) and 3.26 percent (i.e., 4.35 x (.75 / 1.0)), respectively. These are very similar to the OHR of 3.26 percent when WkYr TR = .75.

## Figure 4-6B - Overhead Rates for Combination 15

**for WkYr TR between 0 and 1.0, Budget TR = 1.0, Not Including Avoided Costs**



## Figure 4-6C - DLC vs Budget Shares of Overhead Savings for Combination 15,
**Using Wtd Avg DLC Savings, Budget TR = 1.0**



base's civilian population (i.e., the Civilian Personnel Office's workload factor) if the MEO is implemented. This increases the likelihood of new authorizations in the Civilian Personnel Office, which increases the costs that will be avoided if the CA is outsourced. If a CA is performed only by civilians, implementing the MEO will reduce the base's civilian population, so the Civilian Personnel Office will not grow. If this happens, the SIAC and SNIAC figures will be the same.

The reader can perform his own sensitivity analysis for Budget TR. For a Budget TR = 1.5, the absolute budget savings should be multiplied by 1.5, then divided by the new total savings. Using the Ret Civ-IAC case, the calculations are:

DLC Share: 3,811,860 / [3,811,860 + (326,872 * 1.5)] = .886, or 88.6 percent
Budget Share: (326,872 * 1.5) / [3,811,860 + (326,872 * 1.5)] = .114, or 11.4 percent

Likewise, for a Budget TR = .5, the same calculations are used, only with .5 rather than 1.5. The calculations are:

DLC Share: 3,811,860 / [3,811,860 + (326,872 * .5)] = .959, or 95.9 percent
Budget Share: (326,872 * .5) / [3,811,860 + (326,872 * .5)] = .041, or 4.1 percent

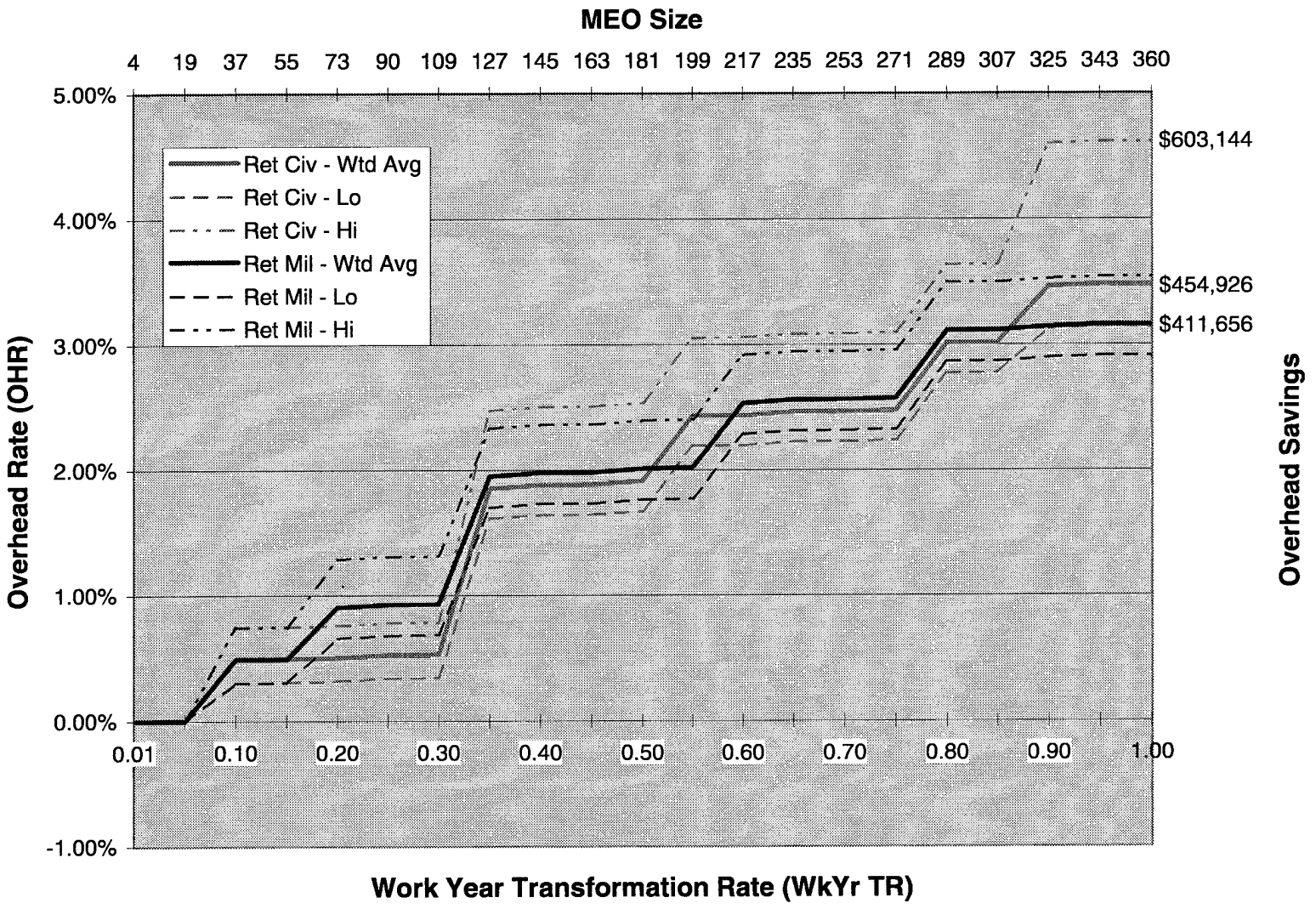
### 4.4.2 Medium CA OHR Behavior (35 – 500 authorizations)

Figure 4-7A graphs the overhead rate for the 60th Equipment Maintenance Squadron (CA 8), with the same sensitivity analyses as were performed in Figure 4-6A, and is characteristic of OHR behavior for medium-sized CAs. As expected, the Wtd Avg line is greater than or equal to the Lo line for all WkYr TRs and less than or equal to the Hi line for all WkYr TRs. The Budget TR = 1.0 for all lines on the graph, and all lines include avoided costs.

For medium-sized CAs, the OHR function is characterized by sudden, significant increases (i.e., steps) in the OHR as the MEO size (as calculated by the WkYr TR) increases and support organization authorizations get eliminated as a result of it being outsourced. As the graph shows, steps don't always occur at the same MEO size for both the Ret Civ and Ret Mil algorithms.

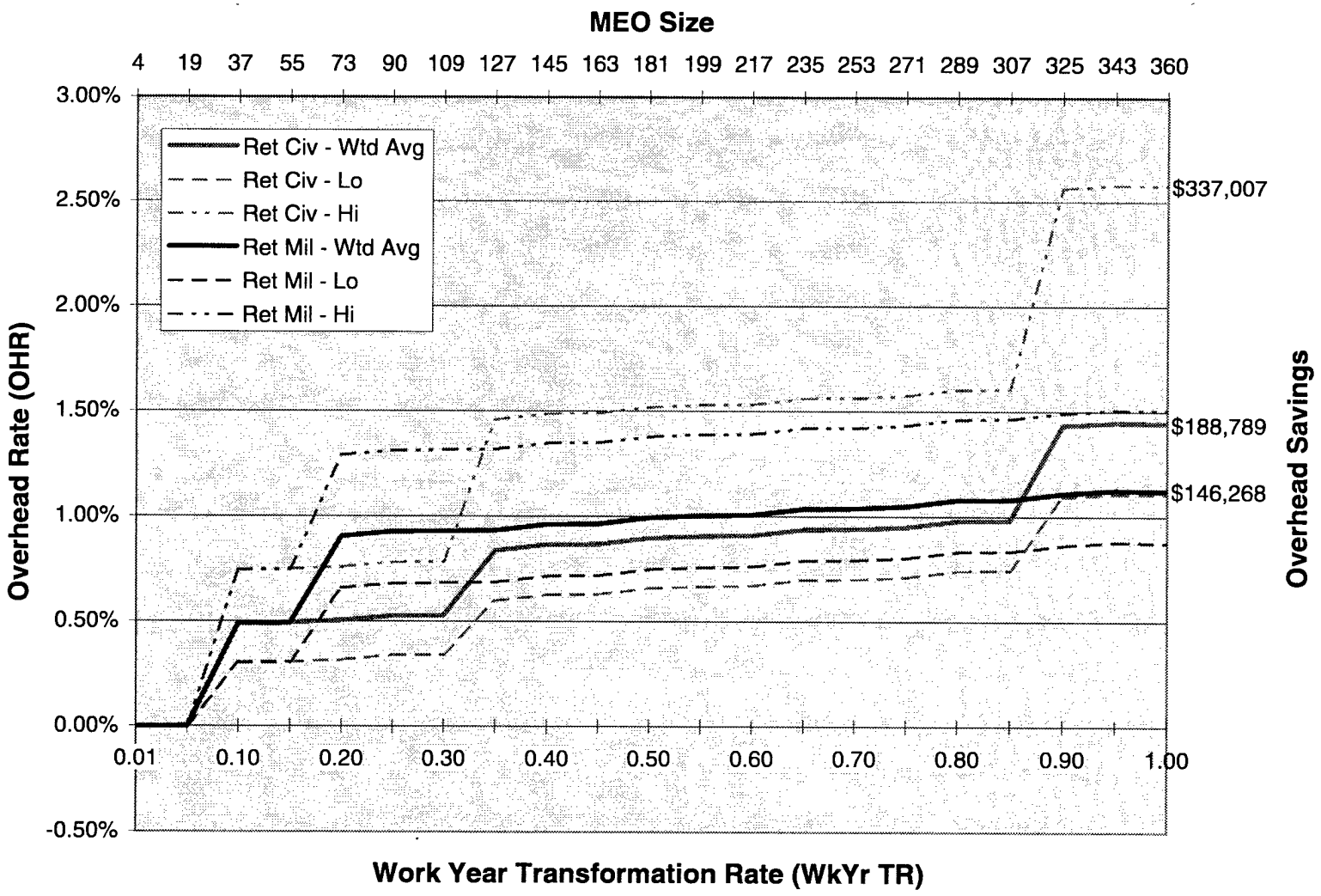
## Figure 4-7A - Overhead Rates for CA 8 (60 Equipment Maintenance Sqdn)

**for WkYr TR between 0 and 1.0, Budget TR = 1.0, Including Avoided Costs**



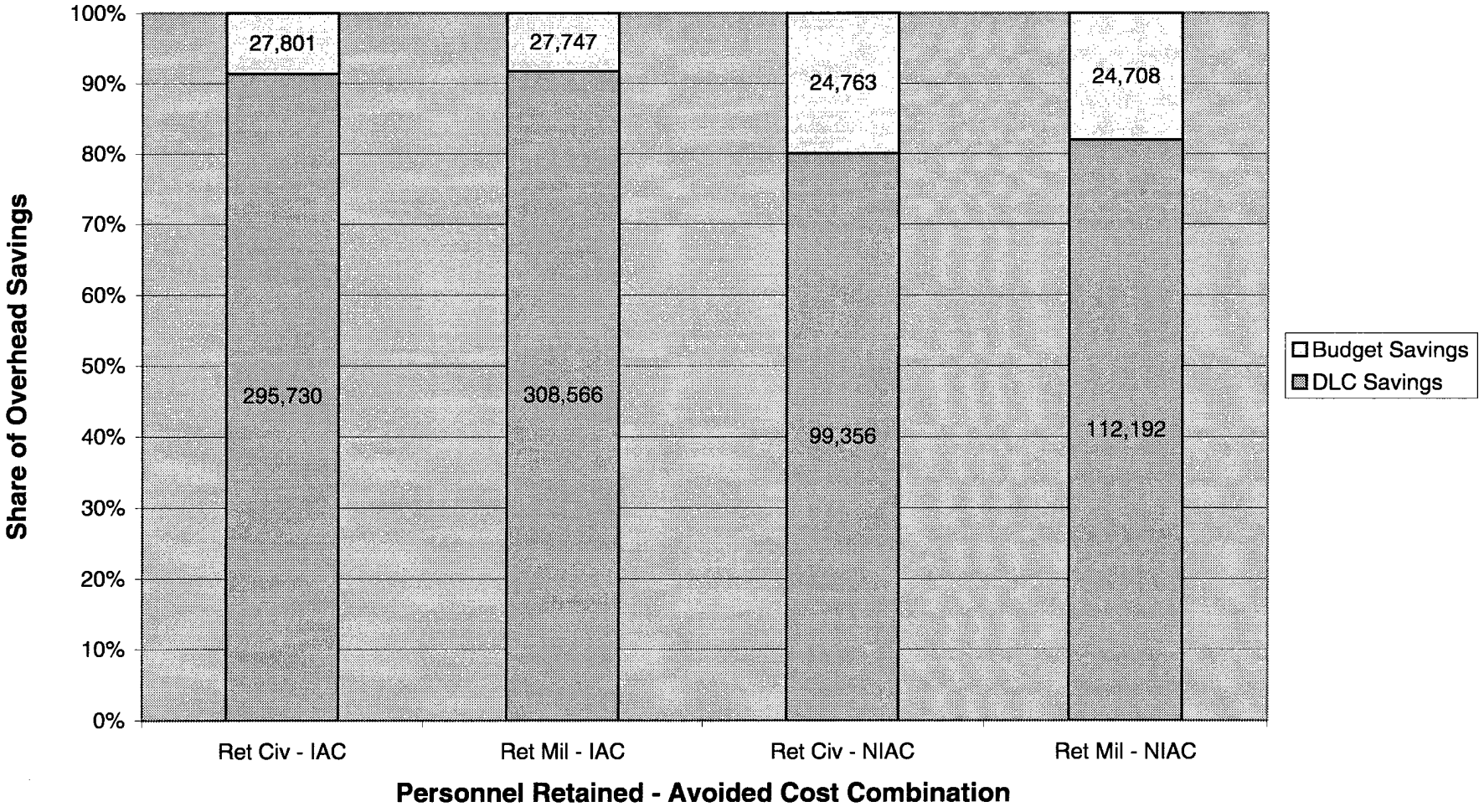
## Figure 4-7B - Overhead Rates for CA 8 (60 Equipment Maintenance Sqdn)

**for WkYr TR between 0 and 1.0, Budget TR = 1.0, Not Including Avoided Costs**



## Figure 4-7C - DLC vs Budget Shares of Overhead Savings for CA 8 (60 Equipment Maintenance Sqdn),

**Using Wtd Avg DLC Savings, Budget TR = 1.0**



This is caused by support organizations with AFMSs that yield man-hours per month and Man-hour Availability Factors (MAF) that are different for civilian and military personnel. The Ret Civ algorithm eliminates military authorizations first. Since the military MAF is 163.2 hours per month, another authorization will not be lost until the support organization's monthly workload drops another 163.2 hours. However, since the Ret Mil algorithm eliminates civilians first, the support organization will lose an authorization for every 147-hour drop in their monthly workload. AFMSs that yield manpower consider civilian and military personnel to be equally productive and, therefore, do not contribute to this characteristic.

Figure 4-7B is the same graph as Figure 4-7A, except avoided costs are not included. The difference in the two graphs occurs above a WkYr TR = .3. The graphs are the same for WkYr TRs between 0 and .3, when the avoided costs become a factor. The precompetitive 60th Equipment Maintenance Squadron has six, 282, and 72 officers, enlisted, and civilians, respectively. Converting all military authorizations into civilian authorizations for MEO implementation will increase the Civilian Personnel Office's population by three authorizations if the WkYr TR = 1.0. This can be seen by the three additional steps that occur in Figure 4-7A versus Figure 4-7B.[29] Obviously, as the WkYr TR falls, so do the number of added authorizations in the Civilian Personnel Office.

Figure 4-7C contains the same information for the 60th Equipment Maintenance Squadron as Figure 4-6C does for Combination 15.

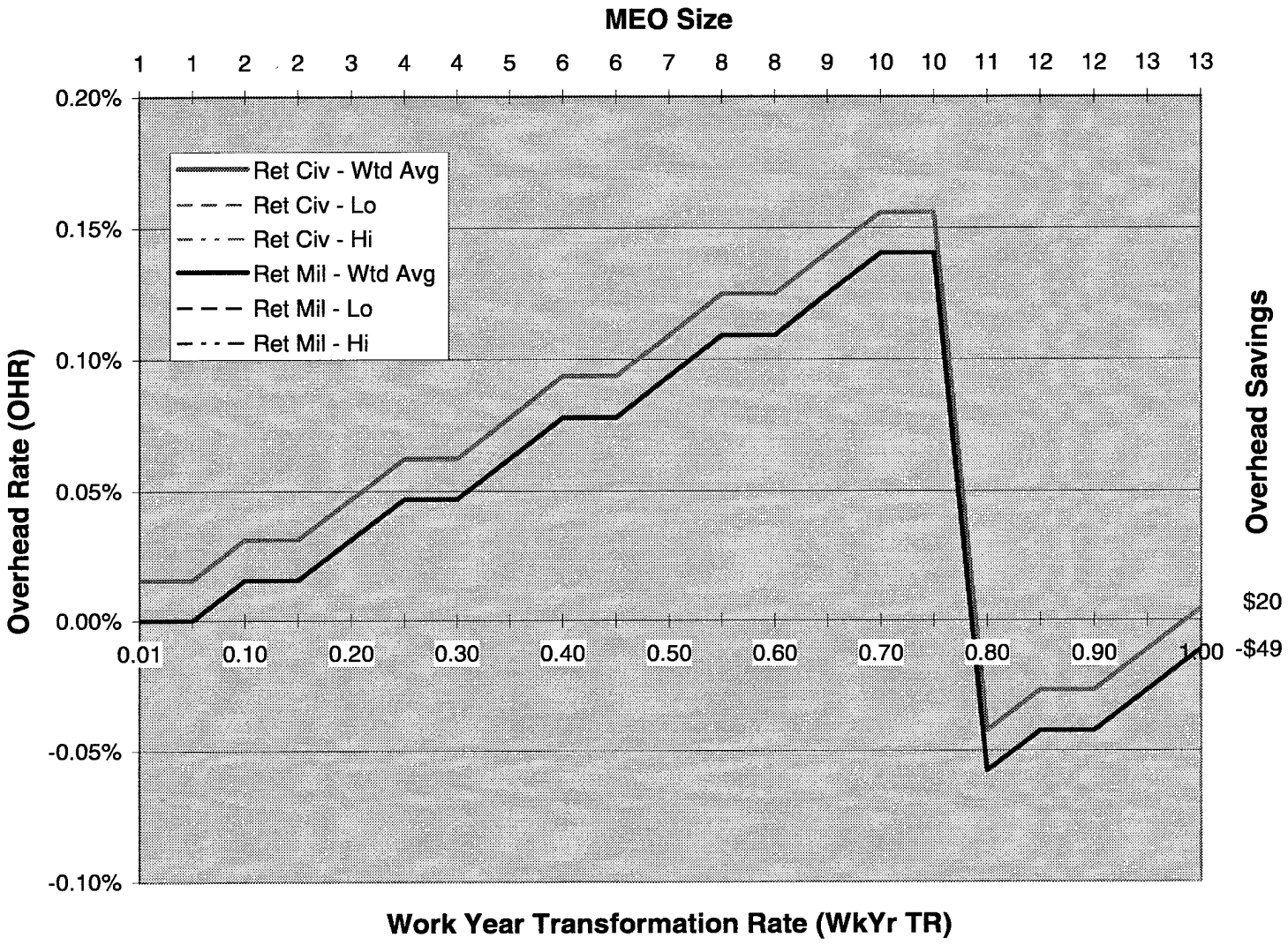
### 4.4.3 Small CA OHR Behavior (1 - 34 authorizations)

Figure 4-8A graphs the overhead rate for Housing Management (CA 12), with the same sensitivity analyses as were performed for large and medium-sized CAs, and is characteristic of overhead behavior for small CAs. A sudden drop occurs in the graph when the MEO reaches 11 and 21 authorizations. These CAs have too few authorizations to affect any support organization manning, so all savings are due to budget (non-labor) changes. This can be seen in Figure 4-8C, where DLC savings are zero. At 11 and 21 authorizations, one additional contract administrator

[29] The Ret Mil OHR function has three additional steps. The Ret Civ algorithm only has two, but the step between WkYr TR = .3 and WkYr TR = .35 is a much larger step (from .53 to 1.85 percent versus from .53 to .84 percent) in Figure 4-7A than in Figure 4-7B.

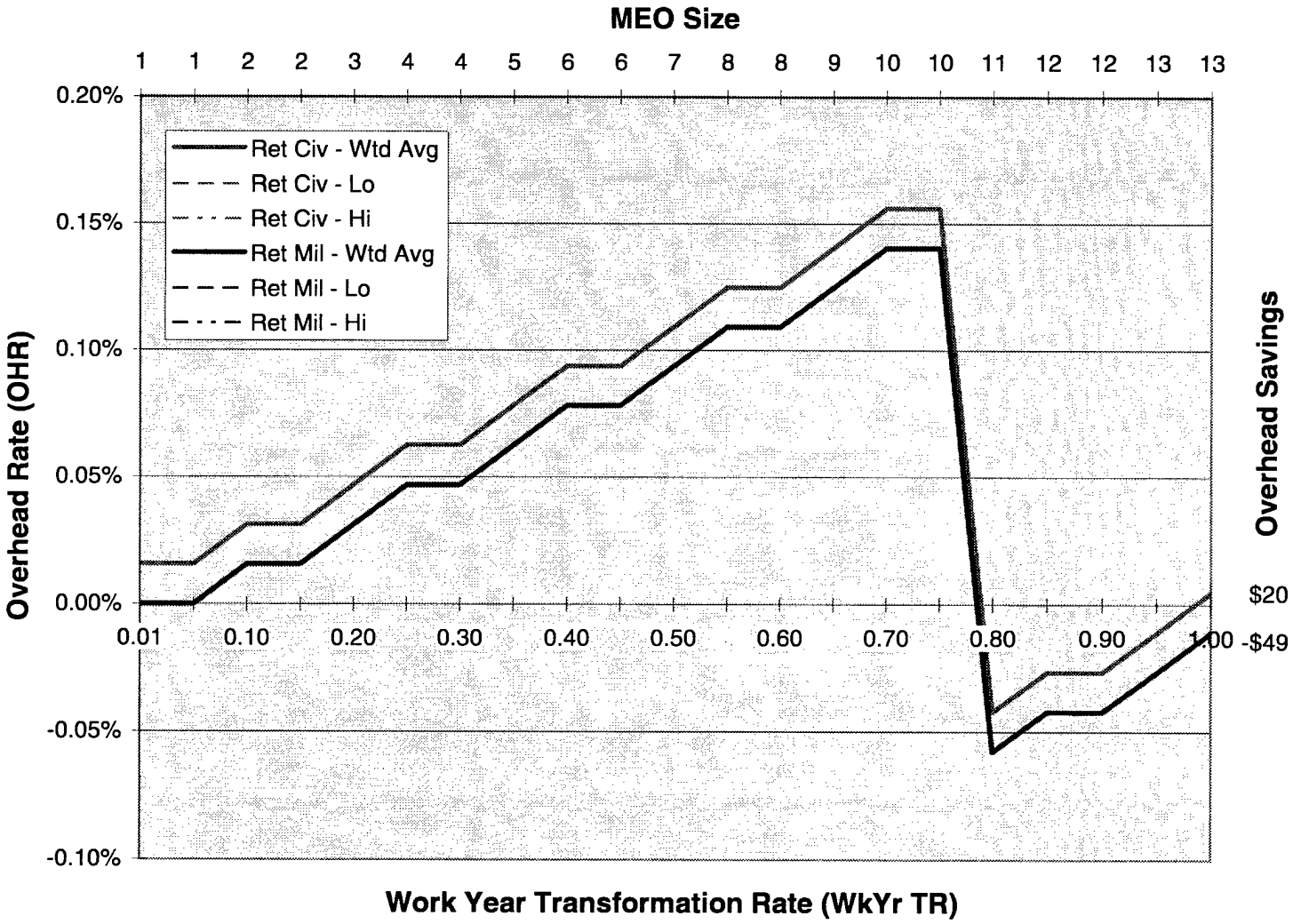
## Figure 4-8A - Overhead Rates for CA 12 (Housing Management)

**for WkYr TR between 0 and 1.0, Budget TR = 1.0, Including Avoided Costs**



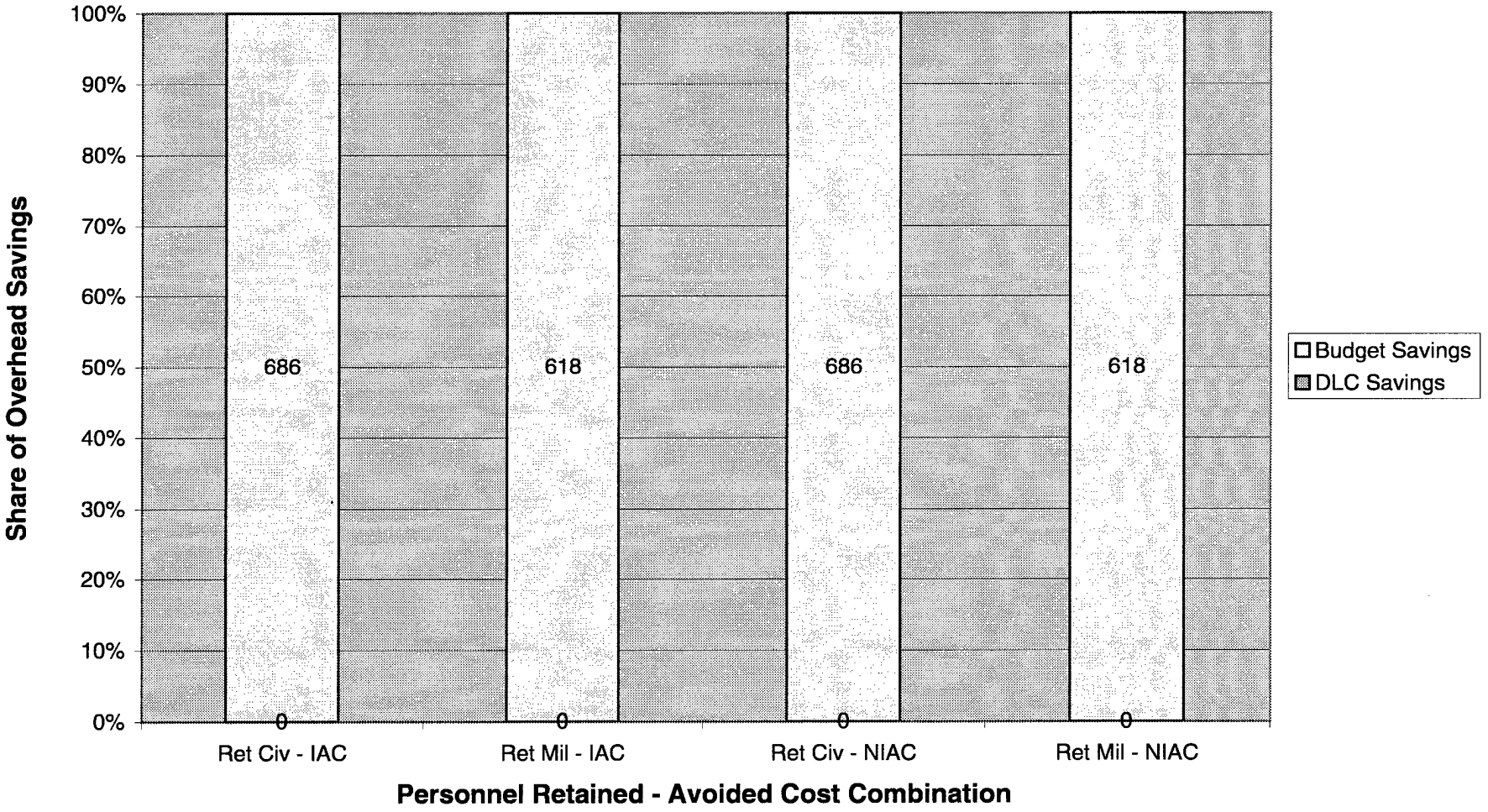
## Figure 4-8B - Overhead Rates for CA 12 (Housing Management)

**for WkYr TR between 0 and 1.0, Budget TR = 1.0, Not Including Avoided Costs**



## Figure 4-8C - DLC vs Budget Shares of Overhead Savings for CA 12 (Housing Management),

**Using Wtd Avg DLC Savings, Budget TR = 1.0**



is hired if the CA is outsourced. The costs incurred for the contract administrator's office supplies, PC, and utilities reduces savings and, therefore, causes a drop in the OHR. The OHR function is characterized by small, but distinct steps and a very low maximum percentage savings, typically below 0.25 percent. Unlike with medium-sized CAs, the steps in savings are due to changes in CA (i.e., MEO) authorizations (and the non-labor overhead costs they incur) rather than changes in support organization authorizations (which incur DLC and non-labor costs). Because no support organization personnel were eliminated by the CA being outsourced, the DLC elimination algorithm used doesn't affect overhead savings. As a result, while it appears there was no sensitivity analysis performed on the DLC elimination algorithm in Figures 4-8A and 4-8B, it is that all three algorithms produced the same result. In addition, since there were no changes in support organization manning as a result of the CA being converted into an MEO or by being outsourced, Figure 4-8B, which doesn't include avoided costs, is the same graph as in Figure 4-8A.

## 4.5 Generalizability of Results (External Validity)

The external validity of the results of any research is an issue, but when the results are based on a case study this is an especially important question. Lacking external validity, the results may be useful for the case-study base, but they will be irrelevant to the rest of the Air Force. A number of assumptions were made in the process of estimating each CA's actual OHR on Travis AFB. They were: (1) MEOs are 100 percent civilian, (2) support organizations would be manned according to AFMS guidelines, (3) WkYr TR = .75, (4) Budget TR = 1.0, (5) the Ret Civ algorithm best simulates the type of authorization (military vs. civilian) eliminated when a support organization loses an authorization, (6) the Wtd Avg DLC elimination algorithm best estimates the reduction in support organization DLCs when it loses an authorization, (7) DLC TR = .75, and (8) support organization manning percentages would remain constant at their precompetitive levels. To evaluate this study's external validity given these assumptions, it is important to evaluate the validity of the assumptions and how reasonable alternative assumptions would affect the estimated OHRs reported in this study.

*MEOs are 100 percent civilian.* Recall (from section 3.2.3) that this assumption was based on historical MEO development policy. The results from this study reaffirm that retaining civilian authorizations generally reduces costs more than retaining military authorizations, so the assumption that MEOs (i.e., most efficient and cost effective organization) will be 100 percent civilian seems reasonable. However, if MEOs contained military personnel, the effect would be to lower the MEO's direct costs and to increase the OHR.[30] To accommodate MEOs that could contain military personnel, the model would have to be modified to include support organizations that provide services available only to military personnel (i.e., "A" units as described in section 3.1.1), as well as the B and C units it currently contains.

*Support organizations would be manned according to AFMS guidelines.* Whereas, for a number of reasons, all bases are not 100 percent manned according to AFMS requirements, AFMSs are the Air Force's standard method of determining manpower requirements for all support functions on an Air Force base. Therefore, it is reasonable to believe that these results are applicable to other Air Force bases. Because many AFMSs have economies of scale built into the equation or table they use to determine manning, it is possible that these results would change if base populations changed significantly (e.g., dropped below 3,000 authorizations[31]). The actual OHR might increase as base populations fall. However, it is important to mention that the increase would be a function of the normal application of the AFMS manning equations/tables and that the model implemented in this study will still be applicable. Therefore, the model can be used to estimate the OHRs for smaller population bases by modifying the appropriate data (e.g., support organization manning, base populations) and rerunning the model.

*WkYr TR = .75.* This assumption was addressed through a sensitivity analysis (i.e., from .01 to 1.0) that is considered in the ranges of OHRs reported in Table 4-1. The effect of a WkYr TR lower than .75 would be to produce an OHR lower than the base-case OHR. A WkYr TR higher than .75 would result in a higher OHR.

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[30] Direct costs would be reduced because military personnel would only be included in the MEO if it were cost effective. The OHR would increase because eliminating military authorizations produces higher OHRs than eliminating civilian authorizations. See section 4.2.5 for a more thorough discussion of OHR results when military authorizations are eliminated (Ret Civ algorithm) vs. civilian authorizations (Ret Mil algorithm).

[31] Three thousand authorizations is an estimate derived from the results reported in *An Analysis of Air Combat Command CONUS-Based Manpower: Economies of Scale in Large vs. Small Bases.*

*Budget TR = 1.0.* This assumption was also addressed through a sensitivity analysis (i.e., from .5 to 1.5) that is considered in the ranges of OHRs reported in Table 4-1. A Budget TR higher than 1.0 would generally increase the *absolute value* of the base-case OHR. For example, if the base-case OHR is 3.1 percent, a Budget TR greater than 1.0 would result in an OHR greater than 3.1 percent. If the base-case OHR is -0.1 percent, a Budget TR greater than 1.0 would result in an OHR less than –0.1 percent.

A reasonable estimate of the magnitude of the change in OHR depends on whether the base-case OHR includes DLC savings or not. If the base-case OHR is close to zero (i.e., no change in DLCs), then multiplying it by the alternative Budget TR would provide a reasonable estimate of what the OHR would be if the model were run with the alternative Budget TR. For example, if the base-case OHR is .2 percent and the alternative Budget TR is .75, then the model would estimate the OHR to be approximately .15 percent (i.e., .2 x .75). If the base-case OHR includes a change in DLCs, then applying the formula [(.9 x base-case OHR) + (.1 x base-case OHR x the alternative Budget TR)] would provide a reasonable estimate of what the OHR would be if the model were run with the alternative Budget TR.[32] For example, if the base-case OHR is 3.5 percent and the alternative Budget TR is 2.0 (i.e., a value outside the range considered by the sensitivity analysis), then the model would estimate the OHR to be approximately 3.85 percent (i.e., [.9 x 3.5] + [.1 x 3.5 x 2.0]).

*Ret Civ algorithm.* Like the WkYr TR and Budget TR assumptions, this assumption was addressed through a sensitivity analysis that is considered in the ranges of OHRs reported in Table 4-1. As discussed earlier (section 4.2.5), using the Ret Mil algorithm would usually result in a lower OHR than using the Ret Civ algorithm.

*Wtd Avg DLC elimination algorithm.* This assumption was addressed through a sensitivity analysis that is considered in the ranges of OHRs reported in Table 4-1, as well. As discussed earlier (section 3.3.3), this algorithm generally overestimates the DLCs that will actually be eliminated as a direct result of the authorization being eliminated. The additional DLCs

[32] The formulas are derived from the result that 90 percent of overhead savings are due to DLC savings. If the OHR is close to zero, indicating there are no DLC savings (i.e., all savings are budget savings), then multiplying the entire base-case OHR by the alternative Budget TR would be an appropriate method of estimating the new OHR. If the base-case OHR includes DLC savings, then only 10 percent of the OHR is potentially affected by the Budget TR. The formula provided applies the alternative Budget TR to the 10 percent of savings that are due to budget savings.

eliminated were an attempt to account for the reduction in DLCs that would accompany a reduced rank structure of the remaining support organization (i.e., a long-run effect of reducing the support organization's size). Without knowing the reasonable alternative algorithm with which to compare the Wtd Avg algorithm, it is difficult to determine the effect it would have on the base-case OHR. Short of selecting a specific authorization to eliminate every time a support organization authorization is eliminated and reevaluating the rank structure of the remaining organization, the Wtd Avg algorithm was suggested by the Manpower Office to best estimate the long-run effect of an eliminated authorization on support organization DLCs.

*DLC = .75.* As mentioned earlier, the DLC TR = .75 can be addressed by the reader by multiplying results by .75 / x, where x is the alternative DLC TR.

*Percent manning would remain constant at precompetitive levels.* Compared to the assumption that support organizations would be manned at 100 percent of their required manpower, the effect of this assumption on each support organization's results would depend on (1) whether the precompetitive manning percentage was above or below 100 percent, and (2) the base's relevant population. For example, assume a notional support organization's AFMS equation is Y = 5 + .0048X, where Y = the support organization's required manning and X = the base's relevant population. Then the equation's intercept and slope are 5 and .0048, respectively. Under the current assumption, the effect of a precompetitive manning percentage higher than 100 percent, 120 percent for instance, is to increase the slope by 20 percent to .00576 (i.e., .0048 x 1.2), so the effective AFMS equation is Y = 5 + .00576X. The result is that the support organization loses authorizations when base population falls at a faster rate than if it were 100 percent manned, and gains authorizations at a faster rate when base population increases.[33] Since authorizations change at a faster rate than if it were 100 percent manned, OHC change at a faster rate, as well this produces a higher OHR than would be the case if the support organization is manned at 100 percent of the required authorizations. The effect of a

[33] Computations for the rate at which the notional organization gains and loses authorizations for different AFMS slopes are below. Relevant authorizations are rounded up because fractional support organization authorizations are rounded up. For the hypothetical slopes below, the notional support organization would lose (or gain) one authorization for the calculated change in relevant authorizations.

AFMS slope = .00576: 1 / .00576 = 163.61 ≈ 164 relevant authorizations on base
AFMS slope = .00480: 1 / .00480 = 208.33 ≈ 209 relevant authorizations on base
AFMS slope = .00384: 1 / .00384 = 260.42 ≈ 261 relevant authorizations on base

precompetitive manning percentage below 100 percent, 80 percent for instance, is to decrease the slope by 20 percent to .00384 (i.e., .0048 x .80), so the effective AFMS equation is Y = 5 + .00384X. The result is that the support organization loses authorizations when base population falls at a slower rate than if it were 100 percent manned, and gains authorizations at a slower rate when base population increases. Since authorizations change at a slower rate than if it were 100 percent manned, OHC change at a slower rate, as well, which produces a lower OHR than would be the case if the support organization is manned at 100 percent of the required authorizations.

Looking at Table 4-7, it is not clear that assuming a 100 percent manning level for support organizations would change the results significantly. The 12 support organizations manned above 100 percent are manned at an average of 147 percent of their required manning. The effect of assuming they will be manned at 100 percent of their required manning level would lower the OHRs from those estimated in this research. There are 17 support organizations manned below 100 percent. Although the average deviation from 100 percent is smaller for these organizations than the deviation for organizations manned above 100 percent, there are more organizations in this category. The effect of assuming they will be manned at 100 percent of their required manning level would be to increase the OHRs from those estimated in this research. The overall result of assuming support organizations will be manned at 100 percent of their required manning level would probably not significantly alter OHRs from those estimated in this study.

**Table 4-7 – Support Organization Precompetitive Manning Percentages**

| Category of Manning Percentage | Number of Support Organizations | Average Manning Percentage |
|---|---|---|
| Manned Below 100 Percent | 17 | 84.2 |
| Manned At 100 Percent | 6 | 100 |
| Manned Above 100 Percent | 12 | 147.1 |

In summary, while different assumptions would produce different OHRs, they wouldn't change the conclusion that the OMB directed 12 percent OHR is an overestimate of overhead savings that would result from outsourcing. In addition, these rates are probably similar to the actual OHRs on other Air Force bases of similar size (i.e., 3,000 authorizations and above). Whereas actual OHRs may be a little higher on small Air Force bases, the model can be used to determine if this is the case.

# Chapter 5 Comparison of Research With Other Studies

The research most relevant to this study pertains to prior efforts to calculate Air Force base OHRs and the use of a predetermined OHR versus an OHC allocating procedure.

## 5.1 Previous Air Force Overhead Estimating Efforts

Whereas there have been a number of studies conducted that address the issue of OHC reduction, there have been surprisingly few conducted to determine the effect a change in mission personnel has on base support personnel, and no studies conducted to determine the Air Force's actual overhead rate. The most widely disseminated analysis on the relationship between changes in mission personnel and changes in support personnel addresses the base support tail (BST) factor.[1] The BST factor, computed quarterly by the Air Force Center for Quality and Management Innovation (AFCQMI),[2] is the Air Force's standard estimate of a base's marginal change in base operating support (BOS) personnel for a given change in mission personnel (i.e., it represents the ratio of expected changes in base support manning for a change in mission personnel). For example, the latest BST factor of 8.1 percent, developed from data for the first quarter of FY 99, means that if 100 mission personnel were eliminated from a base, support personnel can be expected to decrease by approximately 8.1 people. (In reality, this would translate into eight or nine people, depending on the base's populations of military and civilian personnel, and the composition of the 100 eliminated authorizations.) Conversely, if 100

[1] The term "tail" refers to the resources (labor and capital) required to support the fighting forces, or "tooth," of the Air Force. In order to maximize effectiveness and minimize costs, the Air Force tries to maximize the tooth-to-tail ratio. The analysis was performed by the Air Force Management Engineering Agency (1995).

[2] The Air Force Center for Quality and Management Innovation (AFCQMI), located at Randolph AFB, TX, is a Field Operating Agency (FOA) of the Directorate of Manpower, Organization & Quality (AF/XPM), HQ USAF.

mission personnel were added to a base, support personnel can be expected to increase by approximately eight or nine people.[3]

For the purposes of computing the BST factor, AFCQMI defines base support as a list of 177 general support Program Element Codes (PEC) and 19 Functional Account Codes (FAC) that represent non-mission functions. The study uses Installation Location data from the Unit Authorization File (UAF) for 76 bases from eight MAJCOMs.[4] They use a correlation and regression approach to analyze and develop the BST factor because they need a method that identifies and separates fixed from variable base support. (The intercept represents the fixed base support, the slope represents the variable.)

The applicability of this factor to A-76 competitions, however, is dubious. Using a statistical analysis based on past data to develop the BST factor only provides a snapshot-in-time of the past. The results are valid only to the extent that the future is similar to the past. With increasing efforts to outsource and reengineer support activities, the Air Force is specifically attempting to prevent this from being the case. Whereas a quarterly computation of the BST factor reduces the errors that could occur due to changing management policies and actions, it assumes the same constant linear relationship regardless of such variables as base size, MEO size, composition of reduced personnel, and geographic location. In addition, studies indicate there are economies of scale with base overhead, and AFI 38-204, *Programming USAF Manpower* (Dept of AF 1994b), states that the BST factor may be as much as 50 percent smaller if the change in mission manpower is predominantly civilian.[5] The results of this research agree with this assessment and indicate that a 50 percent reduction in the BST factor may be an underestimate if the change in mission manpower is 100 percent civilian. In addition, the BST factor may be ill-suited to estimate changes in BOS personnel if it is BOS personnel that are eliminated (i.e., outsourced) rather than mission or mission support personnel. (See section 3.3.9)

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[3] AFCQMI specifically states that the BST factor should only be used at the macro (i.e., total base support population) level. They don't make any claims about effects on individual categories of base support such as officer, enlisted, or civilian populations.

[4] *Base Support Tail (BST) Factor Report 1995* (AFMEA 1995) describes the methodology AFCQMI (then AFMEA) uses to calculate the BST Factor. However, at that time, overhead was defined as a list of 194 PECs and 19 FACs for 77 installations and eight MAJCOMs. It has since been modified to 177 PECs and 19 FACs for 76 bases and eight MAJCOMs.

[5] AFI 38-204, *Programming USAF Manpower* (Dept of AF 1994B), paragraph 1.7.2.2.

Finally, the BST factor only addresses the change in quantity of support manpower that is expected for a given change in mission personnel. It makes no attempt to convert manpower changes into either labor cost or total overhead cost changes. Whereas OHC can be estimated using a "standard authorization" based on some averaging scheme, the accuracy of the estimate is likely to be lower than the OHC estimated by the model proposed in this research, which considers each organization's actual manning.

Keskel (1995) also performed a study on the relationship between mission personnel and BOS population. He analyzed manpower on Air Combat Command CONUS bases dedicated to BOS activities with the intention of evaluating three potential BOS reducing policies. He analyzed the issue using a combination of statistical approach, similar to the AFCQMI approach taken when developing the BST factor, and AFMS-based approach, similar to the approach taken in this study. His results indicate there are economies of scale in BOS manpower; as the size of a base increases, the percentage of its manpower devoted to BOS decreases. In other words, BOS manning is more sensitive to changes in base population on smaller bases than on larger bases. The implication is that applying a single BST factor to all Air Force bases regardless of base size or the number of mission personnel eliminated could lead to inaccurate estimates of BOS effects. The size of error may or may not be significant, depending on the variability of the true BST between larger and smaller bases and where the predetermined rate falls within the range of actual BST factors.

Keskel developed data distinguishing BOS and non-BOS personnel for each ACC base from the 1994 Consolidated Manpower Database (CMDB). Using linear regression, he determined the change in BOS population on ACC bases to be 21.8 percent that of non-BOS population.[6] This is considerably higher than the BST factor of 8.1 percent. There are several possible explanations for the large difference: (1) the definition of BOS personnel was not identical,[7] (2) the BST factor is computed using 76 bases in eight different MAJCOMs while Keskel only used 21 ACC bases,[8] and (3) BOS percentages may have changed significantly between 1994 when

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[6] The equation he estimated was $Y = 984 + 0.218X$, where Y = active BOS population and X = active non-BOS population.

[7] Keskel used 218 PECs and 20 FACs, AFCQMI used 177 PECs and 19 FACs.

[8] AFMEA (i.e., AFCQMI), in its 1995 analysis, also noted that ACC had a higher than average BOS percentage.

Keskel performed his analysis and 1999 when AFCQMI computed the latest BST factor. Keskel's results also differ from those obtained by this research for several possible reasons: (1) like the BST factor research, Keskel estimated the effect on BOS population, not the effect on OHC changes, so his results are for a change in authorizations while this study's results are for a change in dollars, (2) the definition of BOS personnel was not identical,[9] (3) this research used one AMC base while Keskel used 21 ACC bases[10] and, (4) BOS percentages may have changed significantly between 1994 when Keskel performed his analysis and 1999 when this study was performed. Whatever the cause of the differences between Keskel's results and those of both AFCQMI (i.e., BST factor) and this research, it is clear that using a single predetermined rate can cause some significant errors in estimating variable overhead costs.

Keskel also briefly looked at BOS percentages between six MAJCOMs and CONUS vs. overseas. Average percentages of BOS populations across the six MAJCOMs ranged from a low of 16.4 percent to a high of 38.9, with an average of 25.5 percent.[11] (ACC had an average of 31.6 percent BOS.) Overseas (PACAF, USAFE) bases average 44.3 percent BOS.

As mentioned above, Keskel, like the BST factor research, only looked at the effect on BOS population. There was no attempt to translate BOS population changes into OHC changes.

## 5.2 Predetermined vs. Actual Overhead Rates

An issue in the overhead cost estimating literature is the advantages and disadvantages of using predetermined OHRs vs. calculating actual overhead savings that will result from a particular management action. The choice of a Government-wide rate (e.g., OMB's 12 percent rate), an Air Force-wide rate, or the more complex activity-based costing requires policymakers

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[9] Keskel assumed changes in both the military and civilian populations on base, leading him to use 20 FACs. This research assumed MEOs to be 100 percent civilian, so it only had to use the FACs that are affected by changes in the civilian population. The result was that this research used nine FACs that were used in Keskel's study, plus two other AFMSs that Keskel didn't use.

[10] Both Keskel's study and AFCQMI's indicate AMC has a lower average percent BOS population than ACC.

[11] The average for each MAJCOM was computed by averaging the percent of BOS personnel on each base within the MAJCOM, not by dividing total BOS personnel within the MAJCOM by the MAJCOM's total population.

to make a cost-benefit decision. Selecting more complex allocation methods requires more resources, time, and skill to collect and process accounting and operational information. The value of this additional information should be justified by an increase in benefits from improved decisions.[12]

Noll and Rogerson (1998) present a cogent argument for the use of predetermined rates when outsourcing.[13] In a paper on indirect cost reimbursement to universities for federally sponsored research, they suggest that using a fixed OHR not related to actual overhead costs is better than calculating and reimbursing actual overhead costs for each contract. Their arguments are (1) that it is expensive to calculate actual overhead costs associated with each contract, (2) OHRs are similar across categories of universities (e.g., public vs. private, rank in the quality of education and research), and (3) cost-reimbursement provides little incentive to manage indirect costs efficiently while providing incentives to distort university management (e.g., classify as many expenditures as possible under federal research grants) at the expense of more efficient or sensible management.

Their proposal is that since similar universities have similar overhead rates, periodic, but thorough government audits of overhead at a small sample of peer universities should be used to determine a benchmark, or predetermined, overhead rate to be used in future federal research grants (i.e., research contracts). The idea is that when many firms are producing similar products, reimbursement for any particular firm can be based on the average cost of all firms. This will reduce government expenses by saving the time and resources necessary to calculate actual overhead costs (OHCs) for each contract and will provide incentives to universities to be as efficient as possible since their profit on each grant will be the difference between the predetermined OHR and the university's actual OHR.

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[12] An OSD draft memorandum calling for a Department-wide ABC/M implementation plan indicates there is strong belief that the value-added by ABC/M is worth the additional expense.

[13] Their argument pertains to outsourcing contracts where direct and overhead costs are calculated separately. This is necessary in cost reimbursable contracts, which tend to be used for goods and services with uncertain or unmeasurable outputs. In A-76 competitions for standard goods or services, firms generally include both direct and OHC in their bids, so their argument is not applicable if the CA is outsourced. However, it is applicable to the government bid for every A-76 competition since direct costs (e.g., labor, materials and supplies, etc.) and OHC are estimated separately and, if the government wins the competition, is "reimbursed" (i.e., funded) the cost of performing the CA.

Whereas their suggestion seems reasonable when applied to universities receiving federal research grants (or firms with reimbursable contracts), the results would be quite different if applied to Air Force bases. Assuming actual overhead rates for similar types of bases (e.g., size, mission, geographic location) probably are similar, there are some significant differences between reimbursable contracts for universities (or firms) and Air Force bids for CAs.

The first difference is that universities actually receive the overhead costs estimated by the predetermined OHR; Air Force bases don't. This provides the profit motive for universities to keep OHCs down. Universities are reimbursed at the predetermined rate regardless of their actual OHCs. If their expenses are lower, they make a profit. However, in government bids the fixed overhead rate is only used to construct the MEO's bid. If the base is more efficient than what was included in the bid, it won't reap any "profit" as universities do; they only get funded at the level they need to perform the overhead tasks. Likewise, if the base is less efficient than what was included in the bid, it won't suffer any losses; they will still be funded at the level needed to perform the overhead tasks. This eliminates any incentive a base may have for reducing OHCs and being efficient. This was recognized by the Defense Science Board's Task Force on Outsourcing and Privatization which recommended "activities that meet outsourcing targets ought to receive some of the benefits."[14] The result is that universities prefer a high predetermined OHR because that maximizes their profit, and stakeholders interested in retaining CAs in-house prefer a low predetermined OHR because that enables the Air Force to win more competitions without suffering the consequences of its inefficiencies.

The second difference between cost reimbursable university research contracts and A-76 competitions for Air Force bases is that there is competition among universities for federal research funding. Since there is little difference if a university in the East performs the research or one in the West, research projects can be awarded based on any number of competitive factors, including cost and quality of research. Unlike research projects, A-76 competitions are usually geographically or facility (e.g., air depot maintenance) constrained. For most competitions, especially BOS activities, there is no competition between Air Force bases encouraging them to become more efficient. Using a predetermined OHR in government bids will not change this.

[14] *Report of the Defense Science Board Task Force on Outsourcing and Privatization* (DSB 1996a, 53A).

The last difference is the expense incurred in performing an audit. Auditing an Air Force base probably isn't as expensive or difficult as auditing a university. Since all Air Force bases use the same centralized accounting system, expenses are fairly standardized across bases, not as susceptible to distortion as at universities, and fairly easy to obtain. Data acquisition should become easier with the completion of the Air Force Total Ownership Cost (AFTOC) system (see chapter six discussing the AFTOC system). In addition, the Air Force's relatively centralized, rule-based system probably makes changes in manning and budgets (i.e., marginal costs) more predictable than with universities. Since estimating manpower requirements is a fairly common task in the Air Force, standard operating procedures (SOP) in the form of AFMSs have been developed which make the task a programmed decision process. In March and Simon's discussion of an organization's programmed response to environmental stimuli they state, "Knowledge of the program of an organization permits one to predict in considerable detail the behavior of members of the organization. And the greater the *programming* of individual activities in the organization, the greater the *predictability* of those activities." (March and Simon 1958, 143) The result is that decisions such as the number of authorizations that will be eliminated from each support organization is not a deliberate decision, but rather an "output" from the interactions of Air Force SOPs (i.e., AFMSs). "Decisions are not made as much as they evolve from the policies, procedures, and rules which constitute the organization and its memory . . ." (Pfeffer 1996, 367). Consequently, most overhead savings are determined by these previously established procedures. The automated model proposed in this research uses these procedures to estimate OHCs that will be saved by outsourcing. It requires only readily available data, so computing the estimate is fairly easy and inexpensive, as well.

In summary, Noll and Rogerson's recommendation to use a predetermined OHR seems reasonable for reimbursable contracts where there is competition and OHCs are difficult or expensive to compute. However, with a relatively centralized, rule-based system where data on the most significant overhead factors are easily accessible, it is possible that not performing an analysis would be more costly, especially if there is reason to believe the fixed rate being used is significantly incorrect. Whether expending the additional resources to calculate the actual OHCs for an A-76 competition is justified depends on the cost of calculating the actual OHR and the value of the additional accuracy. To determine the value of the additional accuracy it is

necessary to determine (1) the percentage of competitions that would have been awarded differently if the predetermined OHR was used, and (2) the monetary difference that would result as a consequence of the altered decisions.[15] The closest thing to such a study was the review performed in response to GAO's request (see section 2.2) to determine the effect the 12 percent rule had on competition outcomes.

## 5.3 This Study's Contribution

The primary objective of this study is to evaluate the validity of OMB's 12 percent rule by taking a detailed look at OHRs for individual CAs and combinations, or bundles of CAs. Based on its findings, a key contribution is to inform policymakers that the actual government OHR is significantly lower than 12 percent. This study also describes OHR behavior over the range of MEO sizes and authorization elimination algorithms. In addition, this research complements the research mentioned above by refining the approach to OHC measurement and OHR estimation in several ways. First, by utilizing an AFMS-based approach, it tailors results to specific manpower reductions (e.g., outsourcing competitions) regardless of the type of organization outsourced (i.e., mission or support). An AFMS-based approach also avoids the snapshot-in-time property of a statistical analysis because base Manpower Offices Air Force-wide use AFMSs to determine organization manning. Second, it attempts to translate manpower changes into changes in costs. A major goal of outsourcing is to reduce support costs. Obtaining an estimate of reductions in manpower alone won't inform decision-makers how well they've accomplished that. By using actual base manning to estimate a cost savings associated with a manpower reduction, decision-makers will be better able to determine if goals are being met. And third, it attempts to include

[15] It is not sufficient to determine there is a significant difference between the actual and predetermined OHRs. For example, if the predetermined rate results in a government bid of $10 million and the actual rate results in a bid of $5 million, the contractor would win the contract in both cases if his bid was $4 million. The real-life consequence of using a severely flawed predetermined OHR in this case is that actual savings will be different than expected savings. The actual savings, which is the goal of the competition, will be the same in both cases, though. Likewise, if the predetermined rate results in a government bid of $1 million and the actual rate results in a bid of $4 million, the government would win the competition in both cases if the contractor's bid is $5 million. The result in both cases is that the low-cost producer was selected.

budget effects in addition to manpower effects. Whereas personnel costs are the majority of variable overhead costs, including budget effects attempts to improve the estimate.

# Chapter 6 AFTOC

## 6.1 AFTOC Background

The Air Force Total Ownership Cost (AFTOC) automated management information system and data warehouse is being developed by SAF/FMC to provide routine, timely visibility into Air Force costs (e.g., costs of all major weapon systems, including system components; Air Force infrastructure; all appropriations; and all MAJCOMs) and to satisfy annual O&S reporting requirements to OSD. It includes data for active duty, reserve, and guard components of the Air Force. Current plans are that it will integrate data from at least 10 sources[1] when completed. It is intended to become Air Force leadership's primary tool to assist in effectively managing and controlling weapon system life cycle and infrastructure costs and, as such, to support the Air Force's Reduction in Total Ownership Cost (RTOC) program. It is being developed in four phases, the last of which is currently scheduled to end in September 2000.

AFTOC produces a number of standard reports, but the processed data retains elements such as PEC, RC/CC, and EEIC[2] that can be queried to provide different groupings of costs. In addition, customer support is available for special requests. Access to AFTOC products for authorized users is currently available via the internet.

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[1] Current AFTOC data sources are as follows. For financial data, the sources include: (1) the Command On-line Accounting and Reporting System (COARS), and (2) the Automated Budget Interactive Data Environment System (ABIDES). Data from the Weapon System Cost Retrieval System (WSCRS) is collected and warehoused, but is not used. For personnel and military pay data, the source is the Military Personnel Data System (E300Z extract). Plans are to incorporate data from the HQ AF Manpower Data System (HAF/MDS) and the Defense Joint Military Pay System (DJMS), as well. For flying hours and inventory data, the source is the Program Data System (PDS). Data from the Reliability and Maintainability Information System (REMIS) is collected and used to cross check data from the PDS. For logistics data, the sources include: (1) the Combat Ammunition System (CAS), (2) the Fuels Automated Management System (FAMS), and (3) the Standard Base Supply System (SBSS). For maintenance data, the source is the CORE Automated Maintenance System (CAMS). Source: AFCAA briefing given during a class about AFTOC at Wright-Patterson AFB on July 1, 1999.

[2] A PEC (Program Element Code) identifies forces, equipment, and facilities used to accomplish a particular mission. Examples of program elements are F-16 squadrons, Maverick missiles, and Special Operations Forces. An RC/CC (Responsibility Center/Cost Center) identifies a management control point within an organization and provides the capability to aggregate costs at successively higher levels within the management structure. Base level organizations are assigned RC/CCs to coincide with overall Air Force missions. The purpose of RC/CCs is to relate the cost of operations at base level to Air Force program elements. An EEIC (Elements of Expense Investment Code) is used at base level to identify the nature of goods or services acquired. Examples of EEIs are fuel, pharmaceuticals, electricity, environmental compliance costs, and overtime pay for civilian personnel.

## 6.2 Data Verification

For the AFTOC system to be useful in future A-76 competitions, it is necessary that base level financial data gets transferred to the AFTOC databases properly. In an effort to determine whether this is occurring, current and historical O&S financial data for Travis AFB was requested from the base (i.e., the Financial Analysis Flight of the 60th AMW's Comptroller Squadron) and from AFTOC (i.e., the Air Force Cost Analysis Agency [AFCAA]). A sample of data from the following four periods was compared: (1) end of month (EOM) Sep 97 (i.e., FY97), (2) EOM Mar 98, (3) EOM Sep 98 (i.e., FY98), and (4) EOM Mar 99. There were a total of 3,044 data records for the EOM Sep 97 period, 2,243 data records for the EOM Mar 98 period, 2,699 data records for the EOM Sep 98, 1,937 data records for the EOM Mar 99 period.

One hundred data items were chosen at random to be compared for each of the four periods. EEICs, from three to five digits, for a total of 114 RC/CCs were compared. With the exception of locally defined RC/CCs,[3] which are not included as a separate RC/CC in AFTOC, all data between the databases matched. Since AFTOC data is the same as local base data, all analyses of financial data can be performed at either the base, command HQ, or other levels with access to the internet through the use of an AFTOC "drill-down"[4] tool.

## 6.3 Limitations and Suggested Use of AFTOC in the A-76 Process

As its name suggests, AFTOC is total cost oriented. The goal of the AFTOC Indirect Cost Products is to identify all indirect costs associated with an installation and a MAJCOM and present them in functional breakouts that are of interest to the user.[5] Its standard Indirect Cost

[3] There are nine locally defined RC/CCs on Travis AFB; three are TWCF RC/CCs, six are O&M RC/CCs.

[4] A drill-down tool is a software program that allows the user to retrieve data at successively lower levels of data aggregation. The paths users can follow through the database when searching for data are defined by AFTOC's design.

[5] Source website: http://www.vamosc.tasc.com/

Products report totals indirect costs by category[6] for each installation by command, each installation in total, and each command in total. AFTOC does not currently produce a report that identifies variable indirect costs.

### 6.3.1 Estimating Overhead Savings That Will Result From Outsourcing a Specific CA

There is more than one way to estimate overhead costs that will be eliminated if a CA is outsourced. The contribution that AFTOC can make to the analysis depends on the methodology used. If a retrospective methodology[7] is desired, then AFTOC should have all the information needed to perform the analysis. Historical financial data for all Air Force bases can easily be retrieved,[8] so various types of statistical analyses can be performed on the effect of outsourcing on base costs (e.g., change in total base or total support organization costs per CA authorization outsourced, Air Force-wide or by MAJCOM). If a prospective methodology of estimating OHC is desired, then under current plans AFTOC alone will not have the information required.[9]

*Support Organization DLCs.* The E300Z database, AFTOC's current source of personnel data, contains data that can be used to estimate support organization DLCs that will be eliminated if a particular CA is outsourced. Unfortunately, AFTOC will not contain future authorization data below the MAJCOM level, and current plans are that AFTOC users via the internet will not have access to any personnel cost data below the wing level. Almost all support organizations whose manpower is affected by the civilian and/or CME populations on base are below the squadron level. Not being able to determine these organizations' manning levels and DLCs prevents accurate estimates of manpower reductions and accompanying DLCs. For

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[6] AFTOC uses 19 categories of indirect costs, including Supply Operations, Personnel Support, Base Services, Utilities, Maintenance of Real Property, Medical Operations, Administration, and Headquarters costs.

[7] Retrospective methodologies study what did happen as opposed to prospective methodologies which predict what will happen.

[8] Currently, not all types of systems are included in AFTOC. Plans are to add C4I and other types of systems. In addition, availability of historic financial data varies primarily due to the availability of data from the feeder database. However, the AFTOC database grows with new financial data every month, so future analyses will likely have more data to use.

[9] A discussion of what AFTOC won't be able to do is premature. As mentioned earlier, AFTOC is under development and indirect product requirements are still being defined. Consequently, this discussion can only be based on current plans.

example, for a given drop in base population, it is much more likely that a support organization will lose an authorization if it is currently manned at 200 percent of its required manning than at 50 percent. In addition, without knowledge of the current rank structure, an accurate estimate of the reduction in DLCs that will accompany a reduction in manpower is less likely than if the rank structure were known.

The lack of manpower authorization or personnel cost data below the squadron level hinders AFTOC's usefulness in estimating labor costs for most support organizations affected by outsourcing. Since labor cost savings account for approximately 80 to 90 percent of savings obtained from outsourcing, this is the single biggest impediment to using AFTOC to estimate overhead savings if a particular CA is outsourced. However, manpower authorization data below the squadron level is readily available from other sources (e.g., base UMDs and UPMRs), and a special request for personnel cost data below the wing level from AFTOC can be made. Therefore, a prospective methodology can be used to perform an analysis. The lack of this information just means that, under current plans, AFTOC will not be a one-stop data source for the analysis on a routine basis.

With modifications, AFTOC could probably provide the information needed to estimate overhead savings that will result from a particular CA being outsourced. As discussed above, the most significant change will provide users the same visibility into manpower authorization data as base Manpower Offices. This will allow users to obtain the data needed to perform a prospective analysis of DLCs. This modification is conceptually straightforward and would provide 80 to 90 percent of the solution. However, since overhead savings are a small part of total savings that result from an A-76 competition, and manpower authorization data is readily available from other sources, the additional cost of redesigning AFTOC probably cannot be justified by the payoff from centralizing this data and simplifying A-76 OHC estimation.

*Support Organization Non-Labor Costs.* AFTOC can help in assessing potential non-labor savings, though. Users can easily search for and sift through RC/CC and EEIC data they think are variable costs. Of course, merely knowing a cost is variable is not enough to be able to estimate savings. It is also necessary to know how variable the costs are with respect to changes in population and workload. While AFTOC does not provide this information, it should make analyses attempting to determine this easier.

To ensure the standard products AFTOC produces are useful, AFCAA has been requesting from bases, and continues to request, the kind of information and reports that would help them identify and manage indirect costs. If a standard list of RC/CC-EEIC combinations that represent variable overhead costs can be developed, then AFCAA could design a standard AFTOC product that bases could use to help estimate non-labor overhead savings that can be expected if a particular CA is outsourced.

### 6.3.2 Potential Uses for AFTOC in A-76 Competitions

AFTOC's biggest contribution to A-76 competitions pertains to the main questions of which CAs to compete and what direct-cost savings can be expected, rather than the secondary questions about overhead savings. Assuming a major motivation to outsource activities is to reduce costs, the AF should focus its outsourcing efforts on activities where significant savings can be obtained. The AFTOC system can be used to help identify potential candidates for competition (or reengineering) by identifying CAs that are inefficient *and* that have potential for significant savings. AFTOC will make it fairly easy to compare the expenses of organizations with those of their counterparts at other bases. Relatively quick analyses like this can identify anomolies and inefficiencies that deserve further analysis. For example, a MAJCOM can use AFTOC to list non-labor costs, by EEIC, of a given CA[10] on all its bases. Large differences in a particular expense for no apparent reason (e.g., size of serviced population) would be quickly noticeable. Labor costs can also be compared to identify organizations with unusually high rank structures.[11] In addition, clues for reengineering activities may be revealed if cost drivers for counterpart organizations are not the same.

After identifying the less efficient CAs, the MAJCOM can prioritize the CAs to compete based on some cost prioritization scheme (e.g., total cost, DLCs, material and supply costs). Just because a particular CA appears to be inefficient doesn't necessarily mean it should be high priority to compete. For example, the potential savings will probably not be as large from a

[10] Not all CAs have their own RC/CC. They may be included in an RC/CC that includes other activities. For these cases, AFTOC alone will probably not have the desired data at the appropriate organizational level.

[11] As with overhead costs, if the CA is below the squadron level AFTOC will probably not have the information needed for this analysis.

service activity that has 15 authorizations and an annual budget of $50,000 spread over three EEICs as the potential savings from a maintenance organization with 300 authorizations and a budget of $20 million spread over numerous EEICs. AFTOC will make these types of analyses fairly easy to perform, which will help the Air Force focus its outsourcing (or reengineering) efforts on the specific CAs that have the largest potential savings.

AFTOC can also be used to identify cost drivers of CAs selected for competition. The Air Force will then know specifically which costs should be considered for inclusion in the performance work statement[12] (and, therefore, transfer to the contractor if the CA is outsourced) and which should be furnished by the Government. For example, if the Air Force chooses to outsource the Transportation Squadron, it can either provide the contractor with vehicles and/or spare parts or have the contractor supply them. If the current cost of spare parts is excessively high, AFTOC can be used to discover that fact. After knowing the cost drivers for the CA, the Air Force will be better able to intelligently evaluate potential savings by determining if the private sector possesses economies of scale for them.

Of course, AFTOC can also assist in developing the MEO bid by providing information to estimate material and supply costs (i.e., line 2 of the in-house cost estimate) and other specifically attributable costs (i.e., line 3). (See section 1.3.1 for a discussion of procedures to develop the MEO's cost estimate.) Historical cost data for the CA can easily be obtained for analysis and inclusion in the bid.

[12] The performance work statement (PWS) identifies the essential functions to be performed and includes performance requirements. It serves as the scope of work and is the basis for both government estimates and private sector offers. Consequently, MEO and contractor bids are developed to include the costs of capital goods, materials, and supplies of all items included in the PWS.

# Chapter 7 Suggested Further Research

## 7.1 Alternative OHC Estimating Policy

This research focused on evaluating the accuracy of OMB's 12 percent overhead cost estimating rule. The results not only indicate that 12 percent of DLC is probably an inaccurate estimate of overhead savings that will result from outsourcing, but also that DLC may not be the best allocation base.

In many cases, the OHR that estimates overhead savings varies as MEO size (as calculated by the WkYr TR) varies. Ideally, a good allocation base would yield a constant rate regardless of the MEO size. Figure 4-4 indicates the average OHR for MEOs with 139 authorizations or more to be approximately 2.75 percent. One possible alternative policy is to modify the 12 percent to a lower percentage (e.g., the three percent rule). A quick observation from Figure 4-4 is that MEOs 4, 7, 12, and 18 (i.e., 60$^{th}$ Medical Group, Medical Operations Squadron, Surgical Operations Squadron, and Communications Squadron, respectively) have significantly lower OHRs than the MEOs around them. One possible explanation may be their relatively high percentage of officers. If this is the case, perhaps a table of OHRs based on MEO DLCs and the percentage of officers (or some other causal factor) would more accurately estimate overhead savings.

Another possible policy could be to alter the estimation base from MEO DLCs to another, more predictive allocation base. Since it appears that most variable overhead costs are driven by support organization population which, in turn, is driven by the base population served by the support organizations (i.e., the AFMS workload factors) rather than direct labor costs of the MEO, a preliminary analysis was performed using MEO size as the allocation base. The results are encouraging. By looking at the Average Savings per MEO Authorization graphs in Figures 7-1A, B, and C, it appears that a flat dollar value per eliminated authorization may be a more accurate estimator of overhead savings, especially for MEOs with more than approximately 90 authorizations. The graphs indicate that overhead costs decrease by approximately $1,500 per MEO authorization if the MEO is approximately 40 authorizations or more. As with OHRs

based on MEO DLCs, some results indicate the value may change as the size of the MEO changes, so a table of values may be more appropriate, depending on MEO size.

Figure 7-1A - Average Overhead Savings per MEO Authorization for Combination 1,
Using Wtd Avg DLC Savings, Budget TR = 1.0

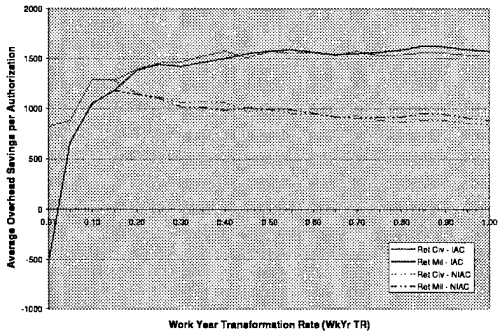



Figure 7-1B - Average Overhead Savings per MEO Authorization for CA 5 (60 Aircraft Generation Squadron),
Using Wtd Avg DLC Savings, Budget TR = 1.0

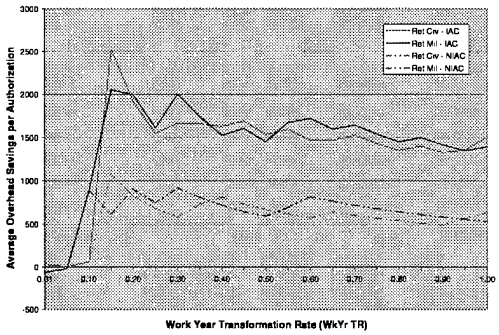
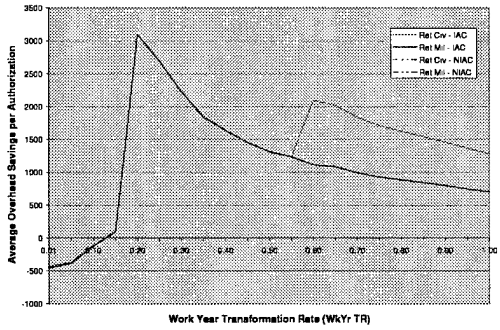



Figure 7-1C - Average Overhead Savings per MEO Authorization for Combination 10,
Using Wtd Avg DLC Savings, Budget TR = 1.0




A third alternative would be to estimate the OHR for each competition. One consequence of this policy may be that CA OHRs become "path sensitive." That is, a CA's OHR may vary, depending on the order the CA is competed. For example, assume no support organization authorizations will be eliminated until 35 authorizations on base are eliminated. If two CAs were going to be competed, one with 30 authorizations and one with 15, then both CAs would have close to a zero percent OHR if it were competed first because neither would cause a support organization authorization to be eliminated. However, if they were competed second, both would have a significantly higher OHR, and the CA with 15 authorizations would have an OHR approximately twice that of the CA with 30 authorizations. This phenomenon could result in some CAs having an unfair competitive advantage while others are unfairly burdened with excessive overhead costs. Therefore, for reasons of consistency and fairness, if A-76 competitions are conducted fairly frequently, estimating the OHR for each competition may not be the best policy. In addition, there are definite advantages to establishing a policy that is easily

documented, understood, and applied. Using a different OHR for each A-76 competition based on a confusing process (e.g., a complex model) could cause discontent for both public and private sector providers.

Further research can determine (1) if MEO size is a better estimation base than MEO DLCs and, if so, what the rate per MEO authorization, or table of rates, should be, and (2) which policy will most likely achieve Air Force outsourcing objectives.

## 7.2 Variable Non-Labor Overhead Costs

As discussed in section 6.3.1, there is not a standard methodology to estimate the reduction in non-labor overhead costs that will result from a particular CA being outsourced. If a standard list of EEICs for RC/CCs that represent variable overhead costs can be developed, similar to the standard definition of BOS used by AFCQMI to compute the BST factor, then AFCAA could design a standard AFTOC product that lists expected changes in non-labor overhead costs under various assumptions that can be used in future A-76 competitions.

## 7.3 Overhead Savings Due to MEO Implementation

Conducting an A-76 competition consumes a lot of time and resources. Since many support organizations are authorized manpower based solely on the military population on base (i.e., their AFMS workload factor is base military population), much of the decrease in support organization manning might occur regardless of the outcome of the competition. In most competitions, all military authorizations in precompetitive CAs are eliminated during the MEO design process. Consequently, it is possible that most of the savings the Air Force realizes from an A-76 competition result from converting the precompetitive organization to the MEO, and that actually outsourcing the MEO saves little additional money. If this is the case, it might be possible for the Air Force to obtain most of the monetary savings associated with A-76 competitions, while avoiding many of the problems associated with outsourcing, by emphasizing the performance of management studies and the conversion of military authorizations to civilian authorizations wherever feasible.

If this approach were taken, the Air Force could avoid spending the additional time and resources that are expended on writing a PWS, issuing an IFB, evaluating proposals, and addressing appeals submitted by disgruntled contractors. Since the current belief is that business process improvement and/or reengineering is the best prospect for savings,[1] this suggested research is timely, as well. This approach doesn't address non-monetary motivations for outsourcing, but it might reduce total costs.[2] In any case, the results would be useful to policymakers.

## 7.4 Higher HQ Cost Functions

Massive outsourcing and reengineering of activities will change the nature of the Air Force and the current paradigm of an Air Force base. It is possible that not all MAJCOMs will be affected by outsourcing to the same degree. For example, those with more mobility requirements may not outsource as many commercial activities or as many personnel as those with fewer mobility requirements. To the degree that the Air Force wants better estimates of total ownership cost, research into the behavior of higher HQ's workloads and manning may be worth pursuing. This knowledge will also be useful in estimating changes in HQ costs that can be expected as increasing numbers of CAs get outsourced at several of the MAJCOM's bases.

[1] CORONA Top briefing, *Strategy for Achieving an Effective and Affordable Air Force,* Slide 13. Source: Assistant Secretary of the Air Force (Financial Management & Comptroller) (SAF/FM) web site: http://www.saffm.hq.af.mil

[2] Total costs include non-monetary costs (e.g., loss of real-time control, risk of catastrophic failure or inadequate investment in specific assets), as well as monetary costs.

# Appendix A –

# Support Organizations Included in the Model, Including AFMSs

# Table A-1 - Support Organizations and AFMSs Included in the Model

| Support Organization | AFMS | AFMS Equation | Independent Variables/ Relevant Populations |
|---|---|---|---|
| **60th Air Mobility Wing** | | | |
| Commander's Support Staff (CC)* | 10A0 | If X > 3,500 Then Y* = 9 Else Y* = 8 | X = Wing Population |
| Staff Judge Advocate | 102A | Y = 2742 + .3998(X - 3000) | X = M,C in H,T |
| Manpower and Quality* | 108A | Y* = Look Up in Matrix | X1 = M,C in H<br>X2 = M,C in H<br>X3 = M,C in H<br>X4 = M,C in H,T<br>X5 = M,C on B |
| Public Affairs | 104A | Y = 679.4 + .0454X1 + 16X2 | X1 = M,C in H,T,G<br>X2 = Local Media Outlets |
| Safety | 106A | Y = 1373.99 + .08681(X - 3000) | X = M,C in H,T |
| Environmental Management | 44EV | Y = 724.2 + .01077X1 + .003191X2 + + .08972X3 + 4.465X4 | X1 = M,C on B<br>X2 = Acres of Land<br>X3 = Buildings<br>X4 = PAI |
| 60th Comptroller Squadron | 151A | Y = 3516 + .3195X1 + .22X2 | X1 = M in H,T<br>X2 = M,C in H,T |
| **60th Logistics Group** | | | |
| Command Section* | 10X0 | If X > 1,350 Then Y* = 6 Else Y* = 5 | X = Group Population |
| **60th Contracting Squadron (CC)*** | XXX0 | Y* = Look Up in Matrices | X1 = Sqdn Officer Pop<br>X2 = Sqdn Enlisted Pop<br>X3 = Sqdn Civilian Pop<br>X4 = Sqdn NAF Pop |
| Commodities Contracting Flight* | 12A0 | Y* = Look Up in Matrix | X = M,C,E in H,T |
| Management Analysis Flight* | " | Y* = Look Up in Matrix | X = Part of Sqdn Pop |
| Services Contracting Flight* | " | Y* = 5 + .0004712X | X = M,C,E in H,T |
| **60th Supply Squadron (CC)*** | XXX0 | Y* = Look Up in Matrices | X1 = Sqdn Officer Pop<br>X2 = Sqdn Enlisted Pop<br>X3 = Sqdn Civilian Pop<br>X4 = Sqdn NAF Pop |
| Base Supply* | 41A0 | Y* = 106.35 + .01265X1 + .7288X2 | X1 = M,C,E in H<br>X2 = PAI |
| **60th Transportation Squadron (CC)*** | XXX0 | Y* = Look Up in Matrices | X1 = Sqdn Officer Pop<br>X2 = Sqdn Enlisted Pop<br>X3 = Sqdn Civilian Pop<br>X4 = Sqdn NAF Pop |
| Combat Readiness and Resources* | 42D1 | Y = Look Up in Matrix | X = M,C on B |
| Vehicle Operations Flight | 42A1 | Y = 1232.91 + 1.01X | X = M,C in H,T |

*AFMS equation is for manpower, not man-hours. CC = Commander's Support Staff
M = Military C = DoD Civilian E = CME N = Contractors NAF = Nonappropriated Fund Civilian PAI = Primary Aircraft Inventory
H = Host Wing T = Tenant B = Base G = Geographically Separated Units

# Table A-1 - Support Organizations and AFMSs in the Model (continued)

| Support Organization | AFMS | AFMS Equation | Independent Variables/ Relevant Populations |
|---|---|---|---|
| **60th Operations Group** | | | |
| Command Section* | 10X0 | If X > 1,350 Then Y* = 6 Else Y* = 5 | X = Group Population |
| **60th Aerial Port Squadron (CC)*** | XXX0 | Y* = Look Up in Matrices | X1 = Sqdn Officer Pop<br>X2 = Sqdn Enlisted Pop<br>X3 = Sqdn Civilian Pop<br>X4 = Sqdn NAF Pop |
| Traffic Management Flight | 42C1 | Y = 3944.33 + .35X1 + .238X2 | X1 = M,C in H,T |
| Personal Property/Passenger Movements | " | | X2 = E since 1994 |
| **60th Support Group** | | | |
| Command Section* | 10X0 | If X > 1,350 Then Y* = 6 Else Y* = 5 | X = Group Population |
| **60th Civil Engineering Squadron (CC)*** | XXX0 | Y* = Look Up in Matrices | X1 = Sqdn Officer Pop<br>X2 = Sqdn Enlisted Pop<br>X3 = Sqdn Civilian Pop<br>X4 = Sqdn NAF Pop |
| Readiness Flight | 44EB | Y = X / (1.091 + .0004365X) | X = C,M in H,T |
| **60th Communications Squadron (CC)*** | XXX0 | Y* = Look Up in Matrices | X1 = Sqdn Officer Pop<br>X2 = Sqdn Enlisted Pop<br>X3 = Sqdn Civilian Pop<br>X4 = Sqdn NAF Pop |
| Telecomm Centers (TCCS) Element | 38AE | Y = 1467.182 + .12611X | X = M,C in H,T |
| Telephone Ops – Element | 38AH | Y = 1106.57 + .0610529X | X = M,C,N on B |
| C4 Systems Security | 38BB | Y = 252.58 + .1015X | X = M,C in H,T |
| Planning & Implementation Flight* | 38C1 | Y* = Look Up in Matrix | X = M,C in H,T |
| **60th Mission Support Squadron (CC)*** | XXX0 | Y* = Look Up in Matrices | X1 = Sqdn Officer Pop<br>X2 = Sqdn Enlisted Pop<br>X3 = Sqdn Civilian Pop<br>X4 = Sqdn NAF Pop |
| Civilian Personnel Flight* | NA | Y* = (1 / 88)X = .0114X | X = C in Host |
| **60th Services Squadron (CC)*** | XXX0 | Y* = Look Up in Matrices | X1 = Sqdn Officer Pop<br>X2 = Sqdn Enlisted Pop<br>X3 = Sqdn Civilian Pop<br>X4 = Sqdn NAF Pop |
| Child Development Centers (3) | 45XD | Y = 387.7 + 8.264X | X = Child capacity |
| **60th Security Forces Squadron (CC)*** | XXX0 | Y* = Look Up in Matrices | X1 = Sqdn Officer Pop<br>X2 = Sqdn Enlisted Pop<br>X3 = Sqdn Civilian Pop<br>X4 = Sqdn NAF Pop |
| Operations Flight | 43A3 | Y = 7569.5473 + .5089X | X = M,C,E in H,T |
| Administration & Reports Flight | 43B1 | Y = 1460.82 + .0883X | X = M,C,E in H,T |
| Training and Resources Flight | 43A4 | Y = 1867.28 + .1355X1 | X1 = M,C,E in H,T |
| | " | Y = 362.82 + .1071X2 | X2 = M req cmbt arms trng |

*AFMS equation is for manpower, not man-hours. CC = Commander's Support Staff
M = Military C = DoD Civilian E = CME N = Contractors NAF = Nonappropriated Fund Civilian PAI = Primary Aircraft Inventory
H = Host Wing T = Tenant B = Base G = Geographically Separated Units

## A.1 Table A-1 Description

The first two columns in Table A-1 list the support organization name and the AFMS that describes how its manpower requirements are determined. The third column lists the AFMS equation or indicates if manpower tables are used instead of an equation. The fourth column defines in general terms the workload factors in the AFMS equation or used to look up manpower requirements in the manpower tables.

The AFMSs usually have paragraphs defining the workload factors and list sources where the information can be found, so the reader should realize that by defining the workload factors in general terms to fit them in the table, sometimes required a loss of detail. The result is that in some cases, even though workload factors for different AFMSs are defined the same in the fourth column, in actuality they aren't. Examples of explanatory paragraphs for the Staff Judge Advocate, Public Affairs, and Base Supply are below.

**Staff Judge Advocate:**[1]

X = Authorized Population Supported

**Definition of X:**

> "The total funded host and tenant authorized population supported by the Staff Judge Advocate, to include the funded local and foreign national civilians. Three thousand is subtracted from this figure because only the population above or below the core wing population of 3,000 will be used in computing the core plus or core minus manpower. To be counted for core plus computations, population must meet the following criteria: obtainable from the manpower data system, in file part A, and receiving full support from the host Judge Advocate function. To compute authorized population supported, compile a list of host and tenant units receiving full services (100 percent support) provided by the base Judge Advocate, obtain the authorized strength for each unit from the workload factor source, and total the authorized strength for the units receiving full support. This result is the authorized population supported. Use this number in the man-hour equation above. Units not meeting this criteria (i.e., those units receiving less than 100 percent support) should not be included in the above computations. This can be submitted as potential variances (following instructions in paragraph 7d) if there is a written agreement requiring the host wing Judge Advocate function to provide specific support (e.g., legal advice) to the unit. A contractor operation entitled to support under a statement of work (SOW) or performance work statement (PWS) may also be submitted as a potential variance for the specific service(s) required to be provided by the government. Do not include contract man-year equivalents (CMEs) in the count." (Dept of AF, AFMS 102A, p. 3)

[1] All quotes in this section (i.e., Staff Judge Advocate) are from Air Force Manpower Standard (AFMS) 102A, *Staff Judge Advocate,* dated 30 May 95, pp. 3.

**Source of X:**

"Obtain the count from the file part A of the manpower data system (MDS) at base level or HQ USAF level. This system is maintained by the manpower personnel at your location. This figure cannot be obtained from the MDS at command level because their system does not include the tenant population. Use the authorized strength for the fourth quarter of the fiscal year in which the application takes place. If the Staff Judge Advocate is providing full or partial support to a population that is not included in the manpower data system, a positive variance should be developed." (Dept of AF, AFMS 102A, p. 3)

**Public Affairs:**[2]

X1 = Authorized Population Supported
X2 = The number of radio, television, and print outlets that routinely impact the workload of the Public Affairs office.

**Definition of X1:**

"The average monthly number of authorized (funded) personnel supported by the FAC 104A, Host Base Public Affairs work center. This includes active duty military, students (pipeline and PCS only), DoD Appropriated Fund civilians, DoD Air Force civilian student personnel assigned to the host base, local/foreign national civilians, geographically separated units (GSUs), and tenant organizations covered by a written agreement; e.g., host tenant support agreement (HTSA), memorandum of understanding (MOU), or interservice support agreement (ISSA). Do not include contract man-year equivalents (CMEs)." (Dept of AF, AFMS 104A, p. 2)

**Source of X1:**

"Active duty military, DoD AF civilians, and local/foreign nationals authorized on base and at GSUs, obtained from the base manpower data system (BMDS), file part A. For active duty military and DoD AF civilian students, use the alpha roster listing of assigned students available from the local school secretary of the Registrar's Office. Include students from all services and foreign students attending training in PCS or pipeline status. Exclude students training in TDY status." (Dept of AF, AFMS 104A, p. 2)

[2] All quotes in this section (i.e., Public Affairs) are from AFMS 104A, *Public Affairs,* dated 21 June 94, pp. 2-3.

**Definition of X2:**

"The number of radio, television, and print outlets that routinely impact the workload of the Public Affairs office. "Routinely impact" is defined as those media outlets that contact a base Public Affairs office by letter or telephone on a regular basis (at least monthly) to: request information (media query); arrange for an interview (on-site or off-); or arrange for an on-site visit to areas under the base's jurisdiction. This definition does not include media outlets the base Public Affairs office might deal with on a one-time basis due to a major accident or incident, or the base newspaper publisher. Also, do not count media (other than those meeting the above criteria) that only attend a unit or base open house. Each media outlet must routinely generate 8 hours or more per month of direct work for the Public Affairs office to qualify under the definition. Any change to the number of media outlets identified in this AFMS must be documented and justified through AFSSMET and SAF/PA for approval. A list of media outlets is at Attachment 6." (Dept of AF, AFMS 104A, p. 2)

**Source of X2:**

"Use the authorized media outlets listed in Attachment 6. Any changes to this list must be submitted to AFSSMET and approved by SAF/PA. NOTE: Do not use the Public Affairs office's initiated media mailing list as a source of count as it may include outlets that are outside the parameters of the basic definition (i.e., news releases are usually provided to more outlets than would fit the definition of 'routinely impacting' the Public Affairs office.)" (Dept of AF, AFMS 104A, p. 3)

**Base Supply:**[3]

X1 = Base Population
X2 = Primary Authorized Inventory (PAI) Equivalent

**Definition of X1:**

"The total number of USAF military and civilian (funded) authorizations in the Unit Authorization File (UAF), File Part A only, to include on- and off-base organizations and Contract Manpower Equivalents (CMEs)." (Dept of AF, AFMS 41A0, p. 2)

**Source of X1:**

"Headquarters Air Force (HAF) Unit Authorization File (UAF), File Part A." (Dept of AF, AFMS 41A0, p. 2)

[3] All quotes in this section (i.e., Base Supply) are from AFMS 41A0, *Base Supply,* dated 13 June 1997, p. 2.

**Definition of X2:**

> "The total number of aircraft inventory at your installation. The number of aircraft will be weighted for application. See application instructions for equivalent factors. Only fixed wing aircraft will be counted. Helicopters will not be counted. Do not count Reserve and Air National Guard aircraft." (Dept of AF, AFMS 41A0, p. 2)

**Source of X2:**

> "The Quarterly Phase Force and Equipage Report (QPF&E) obtained from the Air Force Programs Data System (AFPDS). Count the number of fixed wing PAI at your location. The QPF&E was used to develop the standard. MAJCOMs that do not have access to this information can use the most current PAI source for application. Whatever source you choose to use, you must use authorized and not assigned." (Dept of AF, AFMS 41A0, p. 2)

## A.2 Table A-2 Description

Table A-2 is the Manpower Office's AFMS manpower table. It is included to illustrate the size and complexity of many AFMS manpower tables so the reader will understand why all manpower tables are not included in this appendix.

The table categorizes all Manpower Office responsibilities into five categories: Manpower Management, Wartime Manpower Support, Productivity Programs, Suggestion Program, and Base Manpower Data System. The relevant populations for which the Manpower Office provides each of these categories of services is the same for the first three categories, but not necessarily the same for the fourth and fifth.

To determine the Manpower Office's manpower requirements to fulfill its respective responsibilities (i.e., Manpower Management, Wartime Manpower Support, Productivity Programs, Suggestion Program, and Base Manpower Data System), the range containing the relevant population is found in the left two columns, then the manpower requirement for fulfilling each category of responsibilities is found in the appropriate column (i.e., the column labeled with the category of responsibilities). The sum of the five manpower requirements is computed, then rounded up to the nearest whole person.

# Table A-2 - Manpower Office Manning Matrix (AFMS 108A)

| Serviced Population | | Manpower | Wartime Manpower | Productivity | Suggestion | Base Manpower | Core |
|---|---|---|---|---|---|---|---|
| >= | <= | Management | Support | Programs | Program | Data System | Total |
| 1,000 | 1,999 | 1.57 | 0.59 | 0.53 | 0.32 | 0.3 | 3.31 |
| 2,000 | 2,999 | 2.24 | 0.59 | 0.58 | 0.52 | 0.3 | 4.23 |
| 3,000 | 3,999 | 2.89 | 0.59 | 0.63 | 0.75 | 0.39 | 5.25 |
| 4,000 | 4,999 | 3.05 | 0.59 | 0.66 | 0.97 | 0.44 | 5.71 |
| 5,000 | 5,999 | 3.21 | 0.59 | 0.68 | 1.19 | 0.48 | 6.15 |
| 6,000 | 6,999 | 3.71 | 0.59 | 0.71 | 1.3 | 0.53 | 6.84 |
| 7,000 | 7,999 | 4.21 | 0.59 | 0.73 | 1.41 | 0.57 | 7.51 |
| 8,000 | 8,999 | 4.5 | 0.59 | 0.76 | 1.6 | 0.61 | 8.06 |
| 9,000 | 9,999 | 4.8 | 0.75 | 0.78 | 1.78 | 0.65 | 8.76 |
| 10,000 | 10,999 | 5.23 | 0.75 | 0.82 | 1.9 | 0.69 | 9.39 |
| 11,000 | 11,999 | 5.65 | 0.75 | 0.85 | 2.01 | 0.73 | 9.99 |
| 12,000 | 12,999 | 5.79 | 0.75 | 0.88 | 2.2 | 0.77 | 10.39 |
| 13,000 | 13,999 | 5.92 | 0.75 | 0.9 | 2.39 | 0.8 | 10.76 |
| 14,000 | 14,999 | 6.07 | 0.75 | 0.93 | 2.58 | 0.83 | 11.16 |
| 15,000 | 15,999 | 6.23 | 0.75 | 0.95 | 2.77 | 0.86 | 11.56 |
| 16,000 | 16,999 | 6.39 | 0.75 | 0.98 | 2.96 | 0.89 | 11.97 |
| 17,000 | 17,999 | 6.55 | 0.75 | 1.01 | 3.15 | 0.92 | 12.38 |
| 18,000 | 18,999 | 6.71 | 0.75 | 1.04 | 3.34 | 0.95 | 12.79 |
| 19,000 | 19,999 | 6.87 | 1 | 1.07 | 3.53 | 0.98 | 13.45 |
| 20,000 | 20,999 | 7.03 | 1 | 1.1 | 3.72 | 1.01 | 13.86 |
| 21,000 | 21,999 | 7.19 | 1 | 1.13 | 3.91 | 1.04 | 14.27 |
| 22,000 | 22,999 | 7.35 | 1 | 1.15 | 4.1 | 1.07 | 14.67 |
| 23,000 | 23,999 | 7.51 | 1 | 1.17 | 4.29 | 1.1 | 15.07 |
| 24,000 | 24,999 | 7.67 | 1 | 1.19 | 4.48 | 1.13 | 15.47 |
| 25,000 | 25,999 | 7.83 | 1 | 1.21 | 4.67 | 1.16 | 15.87 |
| 26,000 | 26,999 | 7.99 | 1 | 1.23 | 4.86 | 1.19 | 16.27 |
| 27,000 | 27,999 | 8.15 | 1 | 1.25 | 5.05 | 1.22 | 16.67 |
| 28,000 | 28,999 | 8.31 | 1 | 1.27 | 5.24 | 1.25 | 17.07 |
| 29,000 | 29,999 | 8.47 | 1 | 1.29 | 5.43 | 1.28 | 17.47 |
| 30,000 | 30,999 | 8.63 | 1 | 1.31 | 5.62 | 1.31 | 17.87 |
| 31,000 | 31,999 | 8.79 | 1 | 1.33 | 5.81 | 1.34 | 18.27 |
| 32,000 | 32,999 | 8.79 | 1 | 1.33 | 5.81 | 1.37 | 18.3 |
| 33,000 | 33,999 | 8.79 | 1 | 1.33 | 5.81 | 1.4 | 18.33 |
| 34,000 | 34,999 | 8.79 | 1 | 1.33 | 5.81 | 1.43 | 18.36 |
| 35,000 | 35,999 | 8.79 | 1 | 1.33 | 5.81 | 1.46 | 18.39 |
| 36,000 | 36,999 | 8.79 | 1 | 1.33 | 5.81 | 1.49 | 18.42 |
| 37,000 | 37,999 | 8.79 | 1 | 1.33 | 5.81 | 1.52 | 18.45 |
| 38,000 | 38,999 | 8.79 | 1 | 1.33 | 5.81 | 1.55 | 18.48 |
| 39,000 | 39,999 | 8.79 | 1 | 1.33 | 5.81 | 1.58 | 18.51 |
| 40,000 | 40,999 | 8.79 | 1 | 1.33 | 5.81 | 1.61 | 18.54 |
| 41,000 | 41,999 | 8.79 | 1 | 1.33 | 5.81 | 1.64 | 18.57 |
| 42,000 | 42,999 | 8.79 | 1 | 1.33 | 5.81 | 1.67 | 18.6 |
| 43,000 | 43,999 | 8.79 | 1 | 1.33 | 5.81 | 1.7 | 18.63 |
| 44,000 | 44,999 | 8.79 | 1 | 1.33 | 5.81 | 1.73 | 18.66 |
| 45,000 | 45,999 | 8.79 | 1 | 1.33 | 5.81 | 1.76 | 18.69 |
| 46,000 | 46,999 | 8.79 | 1 | 1.33 | 5.81 | 1.79 | 18.72 |
| 47,000 | 47,999 | 8.79 | 1 | 1.33 | 5.81 | 1.82 | 18.75 |
| 48,000 | 48,999 | 8.79 | 1 | 1.33 | 5.81 | 1.85 | 18.78 |
| 49,000 | 49,999 | 8.79 | 1 | 1.33 | 5.81 | 1.88 | 18.81 |
| 50,000 | 50,999 | 8.79 | 1 | 1.33 | 5.81 | 1.91 | 18.84 |

## A.3 Table A-3 Description

Table A-3 defines the contract administrator requirements for any given MEO. By searching the left column for the range in which the MEO's size falls, the number of contract administrators required to oversee the contract if the CA is outsourced can be determined by looking in the right column.

**Table A-3 - Contract Administration Manpower Requirements**

| MEO FTE Range | Contract Administration FTE Requirement |
|---|---|
| 10 or less | 0.5 |
| 11 – 20 | 1 |
| 21 – 50 | 2 |
| 51 – 75 | 3 |
| 76 – 100 | 4 |
| 101 – 120 | 5 |
| 121 – 150 | 6 |
| 151 – 200 | 7 |
| 201 – 250 | 8 |
| 251 – 300 | 9 |
| 301 – 350 | 10 |
| 351 – 450 | 11 |
| 451 and above | 2.5% of in-house MEO staffing |

Source: Table 12-6 in the Air Force Commercial Activities Program Instruction

# Appendix B –

# Commercial Activities Modeled

## Table B-1 - Key to Commercial Activity and Combination Names

| Commercial Activities (Alphabetical Order) | |
|---|---|
| Aerial Port Squadron | CA 10 |
| 60 Aircraft Generation Sqdn | CA 5 |
| 660 Aircraft Generation Sqdn | CA 6 |
| ATCALS Maintenance | CA 16 |
| Base Network Control | CA 21 |
| Child Development Centers | CA 25 |
| Civ Engrng Material Acquisition | CA 13 |
| Civil Engineering Squadron | Combination 3 |
| Communications Squadron | Combination 4 |
| 60 Component Repair Sqdn | CA 7 |
| Dental Squadron | CA 28 |
| Diag & Therapeutics Sqdn | CA 29 |
| Education Services | CA 22 |
| Entomology | CA 14 |
| 60 Equipment Maint Sqdn | CA 8 |
| Fire Protection | CA 15 |
| Fuels Management | CA 1 |
| Fitness Center | CA 23 |
| Ground Radio Maintenance | CA 17 |
| Hazardous Materials | CA 2 |
| Heating Plant | CA 11 |
| Housing Management | CA 12 |
| Individual Equipment Element | CA 3 |
| 60 Logistics Support Squadron | CA 9 |
| Medical Group | Combination 6 |
| Medical Operations Squadron | CA 27 |
| METNAV Maintenance | CA 19 |
| Port Mortuary | CA 24 |
| Security Forces Squadron | CA 26 |
| Services Squadron | Combination 5 |
| Supply Squadron | Combination 2 |
| Surgical Operations Squadron | CA 30 |
| Telecommunications Center | CA 20 |
| Telephone Ops (Switchboard) | CA 18 |
| Transportation Squadron | CA 4 |
| | |
| **Miscellaneous Combinations** | |
| Everything | Combination 1 |
| Log Grp, Except Contracting Sqdn | Combination 7 |
| CAs 1, 13, 21, 25 | Combination 8 |
| CAs 1, 9, 15, 16, 25, 28 | Combination 9 |
| CAs 9, 13, 18, 22, 23, 25 | Combination 10 |
| CAs 16, 17, 19, 20 | Combination 11 |
| CAs 11, 12, 18 | Combination 12 |
| CAs 16, 19, 20 | Combination 13 |
| CAs 1, 2, 3, 4, 9, 15, 20, 21, 25, 28 | Combination 14 |
| Everything except Medical Grp | Combination 15 |

| Commercial Activities (CA Number Order) | |
|---|---|
| CA 1 | Fuels Management |
| CA 2 | Hazardous Materials |
| CA 3 | Individual Equipment Element |
| CA 4 | Transportation Squadron |
| CA 5 | 60 Aircraft Generation Sqdn |
| CA 6 | 660 Aircraft Generation Sqdn |
| CA 7 | 60 Component Repair Sqdn |
| CA 8 | 60 Equipment Maint Sqdn |
| CA 9 | 60 Logistics Support Squadron |
| CA 10 | Aerial Port Squadron |
| CA 11 | Heating Plant |
| CA 12 | Housing Management |
| CA 13 | CE Material Acquisition |
| CA 14 | Entomology |
| CA 15 | Fire Protection |
| CA 16 | ATCALS Maintenance |
| CA 17 | Ground Radio Maintenance |
| CA 18 | Telephone Ops (Switchboard) |
| CA 19 | METNAV Maintenance |
| CA 20 | Telecommunications Center |
| CA 21 | Base Network Control |
| CA 22 | Education Services |
| CA 23 | Fitness Center |
| CA 24 | Port Mortuary |
| CA 25 | Child Development Centers |
| CA 26 | Security Forces Squadron |
| CA 27 | Medical Operations Squadron |
| CA 28 | Dental Squadron |
| CA 29 | Diag & Therapeutics Sqdn |
| CA 30 | Surgical Operations Squadron |
| | |
| Combination 1 | Everything |
| Combination 2 | Supply Squadron |
| Combination 3 | Civil Engineering Squadron |
| Combination 4 | Communications Squadron |
| Combination 5 | Services Squadron |
| Combination 6 | Medical Group |
| Combination 7 | Log Grp, Except Contracting Sqdn |
| Combination 8 | CAs 1, 13, 21, 25 |
| Combination 9 | CAs 1, 9, 15, 16, 25, 28 |
| Combination 10 | CAs 9, 13, 18, 22, 23, 25 |
| Combination 11 | CAs 16, 17, 19, 20 |
| Combination 12 | CAs 11, 12, 18 |
| Combination 13 | CAs 16, 19, 20 |
| Combination 14 | CAs 1, 2, 3, 4, 9, 15, 20, 21, 25, 28 |
| Combination 15 | Everything except Medical Grp |
| | |

## Table B-2 - Commercial Activities Modeled

| Commercial Activity | Direct Labor Costs | Precompetitive Populations | | | | Commercial Activity | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | Officers | Enlisted | Civilians | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| **Logistics Group** | | | | | | | | | | | | | | | | | | | | |
| **Logistics Group, minus Contracting Sqdn** | 98,087,440 | 2,235 | 37 | 1,936 | 262 | | | | | | | | | | | | | | | |
| **Supply Squadron** | 16,430,696 | 386 | 6 | 315 | 65 | | | | | | | | | | | | | | | |
| Fuels Management | 3,879,375 | 92 | 1 | 82 | 9 | x | | | | | | | | | | | | | | |
| Hazardous Materials | 278,931 | 6 | 0 | 5 | 1 | | x | | | | | | | | | | | | | |
| Individual Equipment Element (IEE) | 428,138 | 10 | 0 | 8 | 2 | | | x | | | | | | | | | | | | |
| **Transportation Squadron** | 6,351,729 | 138 | 2 | 102 | 34 | | | | x | | | | | | | | | | | |
| **60 Aircraft Generation Squadron** | 28,184,336 | 620 | 8 | 571 | 41 | | | | | x | | | | | | | | | | |
| **660 Aircraft Generation Squadron** | 16,248,624 | 374 | 5 | 369 | 0 | | | | | | x | | | | | | | | | |
| **60 Component Repair Squadron** | 10,607,336 | 233 | 3 | 198 | 32 | | | | | | | x | | | | | | | | |
| **60 Equipment Maintenance Squadron** | 17,098,003 | 360 | 6 | 282 | 72 | | | | | | | | x | | | | | | | |
| **60 Logistics Support Squadron** | 4,673,631 | 91 | 3 | 77 | 11 | | | | | | | | | x | | | | | | |
| **Operations Group** | | | | | | | | | | | | | | | | | | | | |
| **Aerial Port Squadron** | 18,338,876 | 415 | 7 | 307 | 101 | | | | | | | | | | x | | | | | |
| **Support Group** | | | | | | | | | | | | | | | | | | | | |
| **Civil Engineering** | 23,646,113 | 492 | 12 | 324 | 156 | | | | | | | | | | | | | | | |
| Heating Plant (Heat/Steam Ops) | 288,154 | 5 | 0 | 0 | 5 | | | | | | | | | | | x | | | | |
| Housing Management | 586,531 | 13 | 0 | 0 | 13 | | | | | | | | | | | | x | | | |
| CE Material Acquisition | 683,752 | 16 | 0 | 11 | 5 | | | | | | | | | | | | | x | | |
| Entomology | 143,121 | 3 | 0 | 2 | 1 | | | | | | | | | | | | | | x | |
| Fire Protection | 3,338,010 | 82 | 0 | 71 | 11 | | | | | | | | | | | | | | | x |
| **Communications Squadron** | 8,996,033 | 188 | 9 | 153 | 26 | | | | | | | | | | | | | | | |
| ATCALS Maintenance | 238,610 | 5 | 0 | 5 | 0 | | | | | | | | | | | | | | | |
| Ground Radio Maintenance | 516,450 | 12 | 0 | 12 | 0 | | | | | | | | | | | | | | | |
| Telephone Operations (Switchboard) | 352,816 | 12 | 0 | 0 | 12 | | | | | | | | | | | | | | | |
| METNAV Maintenance | 215,368 | 5 | 0 | 5 | 0 | | | | | | | | | | | | | | | |
| Telecommunications Center | 787,217 | 19 | 0 | 19 | 0 | | | | | | | | | | | | | | | |
| Base Network Control | 1,716,611 | 36 | 1 | 32 | 3 | | | | | | | | | | | | | | | |
| **Mission Support Squadron** | | | | | | | | | | | | | | | | | | | | |
| Education Services | 519,687 | 9 | 0 | 4 | 5 | | | | | | | | | | | | | | | |
| **Services Squadron** | 7,182,735 | 156 | 3 | 75 | 78 | | | | | | | | | | | | | | | |
| Fitness Center | 581,634 | 14 | 0 | 12 | 2 | | | | | | | | | | | | | | | |
| Port Mortuary | 383,063 | 7 | 0 | 3 | 4 | | | | | | | | | | | | | | | |
| Child Development Centers (3) | 1,556,441 | 41 | 0 | 0 | 41 | | | | | | | | | | | | | | | |
| **Security Forces Squadron** | 8,367,774 | 202 | 3 | 197 | 2 | | | | | | | | | | | | | | | |
| **60th Medical Group** | 101,271,753 | 1,788 | 529 | 1,036 | 223 | | | | | | | | | | | | | | | |
| **Medical Operations Squadron** | 31,996,925 | 543 | 210 | 271 | 62 | | | | | | | | | | | | | | | |
| **Dental Squadron** | 6,400,729 | 105 | 26 | 73 | 6 | | | | | | | | | | | | | | | |
| **Diagnostics and Therapeutics Squadron** | 17,019,908 | 336 | 46 | 234 | 56 | | | | | | | | | | | | | | | |
| **Surgical Operations Squadron** | 22,693,806 | 379 | 167 | 194 | 18 | | | | | | | | | | | | | | | |

## Table B-2 - Commercial Activities Modeled (continued)

| Commercial Activity | Direct Labor Costs | Precompetitive Populations | | | | Commercial Activity | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | Officers | Enlisted | Civilians | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| **Logistics Group** | | | | | | | | | | | | | | | | | | | | |
| **Logistics Group, minus Contracting Sqdn** | 98,087,440 | 2,235 | 37 | 1,936 | 262 | | | | | | | | | | | | | | | |
| **Supply Squadron** | 16,430,696 | 386 | 6 | 315 | 65 | | | | | | | | | | | | | | | |
| Fuels Management | 3,879,375 | 92 | 1 | 82 | 9 | | | | | | | | | | | | | | | |
| Hazardous Materials | 278,931 | 6 | 0 | 5 | 1 | | | | | | | | | | | | | | | |
| Individual Equipment Element (IEE) | 428,138 | 10 | 0 | 8 | 2 | | | | | | | | | | | | | | | |
| **Transportation Squadron** | 6,351,729 | 138 | 2 | 102 | 34 | | | | | | | | | | | | | | | |
| **60 Aircraft Generation Squadron** | 28,184,336 | 620 | 8 | 571 | 41 | | | | | | | | | | | | | | | |
| **660 Aircraft Generation Squadron** | 16,248,624 | 374 | 5 | 369 | 0 | | | | | | | | | | | | | | | |
| **60 Component Repair Squadron** | 10,607,336 | 233 | 3 | 198 | 32 | | | | | | | | | | | | | | | |
| **60 Equipment Maintenance Squadron** | 17,098,003 | 360 | 6 | 282 | 72 | | | | | | | | | | | | | | | |
| **60 Logistics Support Squadron** | 4,673,631 | 91 | 3 | 77 | 11 | | | | | | | | | | | | | | | |
| **Operations Group** | | | | | | | | | | | | | | | | | | | | |
| **Aerial Port Squadron** | 18,338,876 | 415 | 7 | 307 | 101 | | | | | | | | | | | | | | | |
| **Support Group** | | | | | | | | | | | | | | | | | | | | |
| **Civil Engineering** | 23,646,113 | 492 | 12 | 324 | 156 | | | | | | | | | | | | | | | |
| Heating Plant (Heat/Steam Ops) | 288,154 | 5 | 0 | 0 | 5 | | | | | | | | | | | | | | | |
| Housing Management | 586,531 | 13 | 0 | 0 | 13 | | | | | | | | | | | | | | | |
| CE Material Acquisition | 683,752 | 16 | 0 | 11 | 5 | | | | | | | | | | | | | | | |
| Entomology | 143,121 | 3 | 0 | 2 | 1 | | | | | | | | | | | | | | | |
| Fire Protection | 3,338,010 | 82 | 0 | 71 | 11 | | | | | | | | | | | | | | | |
| **Communications Squadron** | 8,996,033 | 188 | 9 | 153 | 26 | | | | | | | | | | | | | | | |
| ATCALS Maintenance | 238,610 | 5 | 0 | 5 | 0 | x | | | | | | | | | | | | | | |
| Ground Radio Maintenance | 516,450 | 12 | 0 | 12 | 0 | | x | | | | | | | | | | | | | |
| Telephone Operations (Switchboard) | 352,816 | 12 | 0 | 0 | 12 | | | x | | | | | | | | | | | | |
| METNAV Maintenance | 215,368 | 5 | 0 | 5 | 0 | | | | x | | | | | | | | | | | |
| Telecommunications Center | 787,217 | 19 | 0 | 19 | 0 | | | | | x | | | | | | | | | | |
| Base Network Control | 1,716,611 | 36 | 1 | 32 | 3 | | | | | | x | | | | | | | | | |
| **Mission Support Squadron** | | | | | | | | | | | | | | | | | | | | |
| Education Services | 519,687 | 9 | 0 | 4 | 5 | | | | | | | x | | | | | | | | |
| **Services Squadron** | 7,182,735 | 156 | 3 | 75 | 78 | | | | | | | | | | | | | | | |
| Fitness Center | 581,634 | 14 | 0 | 12 | 2 | | | | | | | | x | | | | | | | |
| Port Mortuary | 383,063 | 7 | 0 | 3 | 4 | | | | | | | | | x | | | | | | |
| Child Development Centers (3) | 1,556,441 | 41 | 0 | 0 | 41 | | | | | | | | | | x | | | | | |
| **Security Forces Squadron** | 8,367,774 | 202 | 3 | 197 | 2 | | | | | | | | | | | x | | | | |
| **60th Medical Group** | 101,271,753 | 1,788 | 529 | 1,036 | 223 | | | | | | | | | | | | | | | |
| **Medical Operations Squadron** | 31,996,925 | 543 | 210 | 271 | 62 | | | | | | | | | | | | x | | | |
| **Dental Squadron** | 6,400,729 | 105 | 26 | 73 | 6 | | | | | | | | | | | | | x | | |
| **Diagnostics and Therapeutics Squadron** | 17,019,908 | 336 | 46 | 234 | 56 | | | | | | | | | | | | | | x | |
| **Surgical Operations Squadron** | 22,693,806 | 379 | 167 | 194 | 18 | | | | | | | | | | | | | | | x |

## Table B-2 - Commercial Activities Modeled (continued)

| Commercial Activity | Direct Labor Costs | Precompetitive Populations | | | | Outsourcing Combination | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | Officers | Enlisted | Civilians | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | C11 | C12 | C13 | C14 | C15 |
| **Logistics Group** | | | | | | | | | | | | | | | | | | | | |
| **Logistics Group, minus Contracting Sqdn** | 98,087,440 | 2,235 | 37 | 1,936 | 262 | x | | | | | | x | | | | | | | | x |
| **Supply Squadron** | 16,430,696 | 386 | 6 | 315 | 65 | | x | | | | | | | | | | | | | |
| Fuels Management | 3,879,375 | 92 | 1 | 82 | 9 | | | | | | | | x | x | | | | | x | |
| Hazardous Materials | 278,931 | 6 | 0 | 5 | 1 | | | | | | | | | | | | | | x | |
| Individual Equipment Element (IEE) | 428,138 | 10 | 0 | 8 | 2 | | | | | | | | | | | | | | x | |
| **Transportation Squadron** | 6,351,729 | 138 | 2 | 102 | 34 | | | | | | | | | | | | | | x | |
| **60 Aircraft Generation Squadron** | 28,184,336 | 620 | 8 | 571 | 41 | | | | | | | | | | | | | | | |
| **660 Aircraft Generation Squadron** | 16,248,624 | 374 | 5 | 369 | 0 | | | | | | | | | | | | | | | |
| **60 Component Repair Squadron** | 10,607,336 | 233 | 3 | 198 | 32 | | | | | | | | | | | | | | | |
| **60 Equipment Maintenance Squadron** | 17,098,003 | 360 | 6 | 282 | 72 | | | | | | | | | | | | | | | |
| **60 Logistics Support Squadron** | 4,673,631 | 91 | 3 | 77 | 11 | | | | | | | | | x | | | | | x | |
| **Operations Group** | | | | | | | | | | | | | | | | | | | | |
| **Aerial Port Squadron** | 18,338,876 | 415 | 7 | 307 | 101 | x | | | | | | | | | | | | | | x |
| **Support Group** | | | | | | | | | | | | | | | | | | | | |
| **Civil Engineering** | 23,646,113 | 492 | 12 | 324 | 156 | x | | x | | | | | | | | | | | | x |
| Heating Plant (Heat/Steam Ops) | 288,154 | 5 | 0 | 0 | 5 | | | | | | | | | | | | x | | | |
| Housing Management | 586,531 | 13 | 0 | 0 | 13 | | | | | | | | | | | | x | | | |
| CE Material Acquisition | 683,752 | 16 | 0 | 11 | 5 | | | | | | | | x | | x | | | | | |
| Entomology | 143,121 | 3 | 0 | 2 | 1 | | | | | | | | | | | | | | | |
| Fire Protection | 3,338,010 | 82 | 0 | 71 | 11 | | | | | | | | | x | | | | | x | |
| **Communications Squadron** | 8,996,033 | 188 | 9 | 153 | 26 | x | | | x | | | | | | | | | | | x |
| ATCALS Maintenance | 238,610 | 5 | 0 | 5 | 0 | | | | | | | | | x | | x | | x | | |
| Ground Radio Maintenance | 516,450 | 12 | 0 | 12 | 0 | | | | | | | | | | | x | | | | |
| Telephone Operations (Switchboard) | 352,816 | 12 | 0 | 0 | 12 | | | | | | | | | | x | | x | | | |
| METNAV Maintenance | 215,368 | 5 | 0 | 5 | 0 | | | | | | | | | | | x | | x | | |
| Telecommunications Center | 787,217 | 19 | 0 | 19 | 0 | | | | | | | | | | | x | | x | x | |
| Base Network Control | 1,716,611 | 36 | 1 | 32 | 3 | | | | | | | | x | | | | | | x | |
| **Mission Support Squadron** | | | | | | | | | | | | | | | | | | | | |
| Education Services | 519,687 | 9 | 0 | 4 | 5 | x | | | | | | | | | x | | | | | x |
| **Services Squadron** | 7,182,735 | 156 | 3 | 75 | 78 | x | | | | x | | | | | | | | | | x |
| Fitness Center | 581,634 | 14 | 0 | 12 | 2 | | | | | | | | | | x | | | | | |
| Port Mortuary | 383,063 | 7 | 0 | 3 | 4 | | | | | | | | | | | | | | | |
| Child Development Centers (3) | 1,556,441 | 41 | 0 | 0 | 41 | | | | | | | | x | x | x | | | | x | |
| **Security Forces Squadron** | 8,367,774 | 202 | 3 | 197 | 2 | | | | | | | | | | | | | | | x |
| **60th Medical Group** | 101,271,753 | 1,788 | 529 | 1,036 | 223 | x | | | | | x | | | | | | | | | |
| **Medical Operations Squadron** | 31,996,925 | 543 | 210 | 271 | 62 | | | | | | | | | | | | | | | |
| **Dental Squadron** | 6,400,729 | 105 | 26 | 73 | 6 | | | | | | | | | x | | | | | x | |
| **Diagnostics and Therapeutics Squadron** | 17,019,908 | 336 | 46 | 234 | 56 | | | | | | | | | | | | | | | |
| **Surgical Operations Squadron** | 22,693,806 | 379 | 167 | 194 | 18 | | | | | | | | | | | | | | | |

# Appendix C –

# Organizations/Activities on Travis AFB

# Table C-1 - Organizations/Activities on Travis AFB

| Organization | Organization Type | Civilian Support Function | | Commercial Activity |
|---|---|---|---|---|
| | | Labor | Non-Labor Budget | |
| **60th Air Mobility Wing** | B | * | * | ----- |
| Command Section | B | * | * | ----- |
| Staff Judge Advocate | B | * | * | ----- |
| Manpower and Quality | B | * | * | ----- |
| Public Affairs | B | * | * | ----- |
| Safety | B | * | * | ----- |
| Chaplain | A | ----- | ----- | ----- |
| Social Actions | B | ----- | ----- | ----- |
| Environmental Management | B | * | * | ----- |
| Wing Plans | M | ----- | ----- | ----- |
| Historian | M | ----- | ----- | ----- |
| Treaty Compliance | M | ----- | ----- | ----- |
| 60 Comptroller Squadron | B | * | * | ----- |
| Financial Services Flight | B | * | * | ----- |
| Customer Service Section | B | * | * | ----- |
| Customer Support Section | B | * | * | ----- |
| Accounting Liaison Section | B | * | * | ----- |
| Financial Analysis Flight | B | * | * | ----- |
| | | | | |
| **60th Logistics Group** | B | * | * | ----- |
| Command Section | B | * | * | ----- |
| **60th Contracting Squadron** | B | * | * | ----- |
| Commodities Flight | B | * | * | ----- |
| Construction Flight | B | ----- | ----- | ----- |
| Services Flight | B | * | * | ----- |
| Systems/Analysis Flight | B | * | * | ----- |
| O&P (Outsourcing & Privatization) | B | ----- | ----- | ----- |
| **60th Supply Squadron** | B | * | * | * |
| Command Section | B | * | * | * |
| Management and Systems Flight | B | * | * | * |
| Material Management Flight | B | * | * | * |
| Hazardous Material Flight | B | * | * | * |
| Fuels Management Flight | B | ----- | ----- | * |
| Material Storage and Distribution Flight | B | * | * | * |
| Combat Operations Support Flight | B | * | * | * |
| **60th Transportation Squadron** | B | * | * | * |
| Command Section | B | * | * | * |
| Vehicle Operations Flight | B | * | * | * |
| Dispatch | B | * | * | * |
| Equipment Support | B | * | * | * |
| Fleet Management | B | * | * | * |
| Vehicle Maintenance Flight | B | * | * | * |
| General Purpose | B | * | * | * |
| Special Purpose | B | * | * | * |
| Allied Trades | B | * | * | * |
| Refueling MX (Maintenance) | B | * | * | * |
| 463L MX | B | * | * | * |
| Maintenance Control and Analysis | B | * | * | * |
| Combat Readiness and Resource Flight | M | * | * | * |

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## Table C-1 - Organizations/Activities on Travis AFB (continued)

| Organization | Organization Type | Civilian Support Function | | Commercial Activity |
|---|---|---|---|---|
| | | Labor | Non-Labor Budget | |
| **60 Aircraft Generation Squadron** | M | ----- | ----- | * |
| Sortie Generation Flight (SGF) Gold Flight | M | ----- | ----- | * |
| SGF Blue Flight | M | ----- | ----- | * |
| **660 Aircraft Generation Squadron** | M | ----- | ----- | * |
| SGF Red Flight | M | ----- | ----- | * |
| SGF Blue Flight | M | ----- | ----- | * |
| **60 Component Repair Squadron** | M | ----- | ----- | * |
| Propulsion Flight | M | ----- | ----- | * |
| Avionics Flight | M | ----- | ----- | * |
| AGE (Aerospace Ground Equipment) Flight | M | ----- | ----- | * |
| TMDE (Test, Measure, & Diagnostic Equipment) Flight | M | ----- | ----- | * |
| **60 Equipment Maintenance Squadron** | M | ----- | ----- | * |
| Accessory Flight | M | ----- | ----- | * |
| Inspection Flight | M | ----- | ----- | * |
| Fabrication Flight | M | ----- | ----- | * |
| **60 Logistics Support Squadron** | M | ----- | ----- | * |
| Operations Flight | M | ----- | ----- | * |
| Training Flight | M | ----- | ----- | * |
| **60th Operations Group** | B | * | * | ----- |
| Command Section | B | * | * | ----- |
| **21 Airlift Squadron** | M | ----- | ----- | ----- |
| **22 Airlift Squadron** | M | ----- | ----- | ----- |
| **6 Air Refueling Squadron** | M | ----- | ----- | ----- |
| **9 Air Refueling Squadron** | M | ----- | ----- | ----- |
| **60 Operations Support Squadron** | M | ----- | ----- | ----- |
| **60 Aerial Port Squadron** | B | * | * | * |
| Combat Readiness/Resources Flight | M | ----- | ----- | * |
| Mobility | M | ----- | ----- | * |
| Resources | M | ----- | ----- | * |
| Security | M | ----- | ----- | * |
| Reserves | M | ----- | ----- | * |
| Training | M | ----- | ----- | * |
| Safety | M | ----- | ----- | * |
| Fleet Flight | M | ----- | ----- | * |
| Traffic Management Flight | B | * | * | * |
| Documentation | B | * | * | * |
| Packing and Crating | B | * | ----- | * |
| Household Goods | B | * | ----- | * |
| Passenger Service | B | * | ----- | * |
| Air Passenger Flight | B | ----- | ----- | * |
| Air Terminal Operations Flight | M | ----- | ----- | * |
| ATOC | M | ----- | ----- | * |
| Data Records | M | ----- | ----- | * |
| Computer Room | M | ----- | ----- | * |
| Load Planning | M | ----- | ----- | * |
| Air Freight Flight | M | ----- | ----- | * |
| Cargo Processing | M | ----- | ----- | * |
| Ramp | M | ----- | ----- | * |
| Mechanized Handling Equipment | M | ----- | ----- | * |
| Special Handling | M | ----- | ----- | * |

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## Table C-1 - Organizations/Activities on Travis AFB (continued)

| Organization | Organization Type | Civilian Support Function | | Commercial Activity |
|---|---|---|---|---|
| | | Labor | Non-Labor Budget | |
| **60th Support Group** | B | * | * | ----- |
| Command Section | B | * | * | ----- |
| **60th Civil Engineering Squadron** | B | * | * | * |
| Command Section | B | * | * | * |
| Engineering Flight | B | ----- | ----- | * |
| Explosive Ordnance Disposal Flight | B | ----- | ----- | * |
| Fire Protection Flight | B | ----- | ----- | * |
| Family Housing Flight | A | ----- | ----- | * |
| Operations Flight | B | ----- | ----- | * |
| Resources Flight | B | ----- | ----- | * |
| Readiness Flight | B | ----- | ----- | * |
| **60th Communications Squadron** | B | * | * | * |
| Command Section | B | * | * | * |
| Unit Training | B | ----- | ----- | * |
| Information Systems Flight | B | ----- | * | * |
| Systems Overhead Element | B | ----- | ----- | * |
| Support Overhead Element | B | ----- | * | * |
| Comm/Elec Oper Admin | B | ----- | * | * |
| Information Assurance Flight | B | ----- | * | * |
| Publishing Management | B | ----- | ----- | * |
| Publications Management | B | ----- | ----- | * |
| Publications Distribution Office | B | ----- | ----- | * |
| Forms Management | B | ----- | ----- | * |
| C4 Systems Security | B | * | * | * |
| Mission Systems Flight | M | ----- | ----- | * |
| Systems Support Element | M | ----- | ----- | * |
| Job Control Element | M | ----- | ----- | * |
| Plans Flight | B | * | * | * |
| Telecommunications Centers (TCCS) Element | B | * | * | * |
| Telephone Ops - ESS/Non-ESS Admin Switchboard Element | B | * | * | * |
| Telephone Installation - Outside Plant Maintenance Section | B | ----- | ----- | Contracted |
| Telephone Switching Systems Maintenance - Inside Plant Section | B | ----- | ----- | Contracted |
| Visual Info Element | B | ----- | ----- | Contracted |
| **60th Mission Support Squadron** | B | * | * | ----- |
| Command Section | B | * | ----- | ----- |
| Civilian Personnel Office | C | * | * | ----- |
| Military Personnel Flight | A | ----- | ----- | ----- |
| Education Office | B | ----- | ----- | * |
| Family Support Center | B | ----- | ----- | ----- |
| Airman Leadership School | A | ----- | ----- | ----- |
| **60th Security Forces Squadron** | B | * | * | ----- |
| Command Section | B | * | * | ----- |
| Administration and Reports Flight | B | * | * | ----- |
| Operations Flight | B | * | * | ----- |
| Training and Resources Flight | B | * | * | ----- |

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## Table C-1 - Organizations/Activities on Travis AFB (continued)

| Organization | Organization Type | Civilian Support Function | | Commercial Activity |
|---|---|---|---|---|
| | | Labor | Non-Labor Budget | |
| **60th Services Squadron** | B | * | * | * |
| Command Section | B | * | ----- | * |
| Readiness | B | ----- | ----- | * |
| Training | B | ----- | ----- | * |
| Maintenance | B | ----- | ----- | NAF |
| Marketing & Publicity | B | ----- | ----- | * |
| Human Resources | B | ----- | ----- | * |
| Resource Management Flight | B | ----- | ----- | * |
| Military/Combat Support Flight | B | ----- | ----- | * |
| Food Service Administration | A | ----- | ----- | * |
| Mess Attendant Contract | A | ----- | ----- | Contracted |
| Lodging | B | ----- | ----- | NAF |
| Physical Fitness & Sports | B | ----- | * | * |
| Varsity & Intramural Sports | A | ----- | ----- | * |
| Fitness Center | B | ----- | * | * |
| Library | B | ----- | ----- | Contracted |
| Port Mortuary | B | ----- | ----- | * |
| Community Support Flight | B | ----- | ----- | * |
| Skills Development Center | B | ----- | ----- | * |
| Arts & Crafts Shop | B | ----- | ----- | NAF |
| Framing Shop | B | ----- | ----- | NAF |
| Wood Shop | B | ----- | ----- | NAF |
| Auto Hobby Shop | B | ----- | ----- | * |
| Aero Club | B | ----- | ----- | NAF |
| Information, Tickets, and Tours | B | ----- | ----- | NAF |
| Outdoor Recreation | B | ----- | ----- | * |
| Pool | B | ----- | ----- | * |
| Fam Camp | A | ----- | ----- | NAF |
| Resource Recovery & Recycling Program | | ----- | ----- | NAF |
| Yacht Club | B | ----- | ----- | NAF |
| Family Member Support Flight | B | * | * | * |
| Child Development Centers (3) | B | * | * | * |
| Family Day Care | B | ----- | * | * |
| Youth Activities Center | B | ----- | * | * |
| Skating Rink | B | ----- | ----- | NAF |
| Business Support Flight | B | ----- | ----- | * |
| Golf Course | B | ----- | ----- | NAF |
| Bowling Center | B | ----- | ----- | NAF |
| Delta Breeze Club (O' and E' Clubs) | B | ----- | ----- | NAF |
| Pizzeria | B | ----- | ----- | NAF |
| Veterinary Clinic | B | ----- | ----- | NAF |
| Equestrian Center | B | ----- | ----- | NAF |
| Other Agencies | A | ----- | ----- | * |
| Fisher House | A | ----- | ----- | NAF |
| **60th Medical Group** | A | ----- | ----- | * |
| Medical Support Squadron | A | ----- | ----- | * |
| Aerospace Medicine Squadron | A | ----- | ----- | * |
| Medical Operations Squadron | A | ----- | ----- | * |
| Dental Squadron | A | ----- | ----- | * |
| Diagnostics and Therapeutics Squadron | A | ----- | ----- | * |
| Surgical Operations Squadron | A | ----- | ----- | * |

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## Table C-1 - Organizations/Activities on Travis AFB (continued)

| Organization | Organization Type | Civilian Support Function | | Commercial Activity |
|---|---|---|---|---|
| | | Labor | Non-Labor Budget | |
| **AMC Tenant Organizations** | | | | |
| | | | | |
| **15th Air Force** | T | ----- | ----- | ----- |
| Command Section | T | ----- | ----- | ----- |
| Operations Division | T | ----- | ----- | ----- |
| Air Mobility Operations | T | ----- | ----- | ----- |
| Training | T | ----- | ----- | ----- |
| Air Mobility Integration | T | ----- | ----- | ----- |
| Standardization and Evaluation | T | ----- | ----- | ----- |
| Air Transportation Prog | T | ----- | ----- | ----- |
| Staff Judge Advocate | T | ----- | ----- | ----- |
| Logistics Division | T | ----- | ----- | ----- |
| Maintenance | T | ----- | ----- | ----- |
| Logistics Plans and Programs | T | ----- | ----- | ----- |
| Supply | T | ----- | ----- | ----- |
| Reserve Affairs | T | ----- | ----- | ----- |
| Safety | T | ----- | ----- | ----- |
| **615th Air Mobility Operations Group** | T | ----- | ----- | ----- |
| Command Section | T | ----- | ----- | ----- |
| 615 Air Mobility Operations Squadron | T | ----- | ----- | ----- |
| 615 Mobility Squadron | T | ----- | ----- | ----- |
| 715 Mobility Squadron | T | ----- | ----- | ----- |
| 815 Mobility Squadron | T | ----- | ----- | ----- |
| **349th Air Mobility Wing** | T | ----- | ----- | ----- |
| Command Section | T | ----- | ----- | ----- |
| Staff Judge Advocate | T | ----- | ----- | ----- |
| Quality | T | ----- | ----- | ----- |
| Public Affairs | T | ----- | ----- | ----- |
| Safety | T | ----- | ----- | ----- |
| Chaplain | T | ----- | ----- | ----- |
| Comptroller | T | ----- | ----- | ----- |
| Historian | T | ----- | ----- | ----- |
| Plans | T | ----- | ----- | ----- |
| Social Actions | T | ----- | ----- | ----- |
| **349th Logistics Group** | T | ----- | ----- | ----- |
| Command Section | T | ----- | ----- | ----- |
| 349 Aircraft Generation Squadron | T | ----- | ----- | ----- |
| 749 Aircraft Generation Squadron | T | ----- | ----- | ----- |
| 349 Component Repair Squadron | T | ----- | ----- | ----- |
| 349 Equipment Maintenance Squadron | T | ----- | ----- | ----- |
| 349 Logistics Support Squadron | T | ----- | ----- | ----- |
| **349th Operations Group** | T | ----- | ----- | ----- |
| Command Section | T | ----- | ----- | ----- |
| 301 Airlift Squadron | T | ----- | ----- | ----- |
| 312 Airlift Squadron | T | ----- | ----- | ----- |
| 70 Air Refueling Squadron | T | ----- | ----- | ----- |
| 79 Air Refueling Squadron | T | ----- | ----- | ----- |
| 349 Operations Support Flight | T | ----- | ----- | ----- |
| 349 Airlift Control Flight | T | ----- | ----- | ----- |
| 349 Aeromedical Evacuation Squadron | T | ----- | ----- | ----- |
| 45 Aerial Port Squadron | T | ----- | ----- | ----- |
| 55 Aerial Port Squadron | T | ----- | ----- | ----- |
| 82 Aerial Port Squadron | T | ----- | ----- | ----- |

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## Table C-1 - Organizations/Activities on Travis AFB (continued)

| Organization | Organization Type | Civilian Support Function | | Commercial Activity |
|---|---|---|---|---|
| | | Labor | Non-Labor Budget | |
| **349th Support Group** | T | ----- | ----- | ----- |
| Command Section | T | ----- | ----- | ----- |
| 349th Civil Engineering Squadron | T | ----- | ----- | ----- |
| 349th Communications Squadron | T | ----- | ----- | ----- |
| 349th Mission Support Squadron | T | ----- | ----- | ----- |
| 349th Security Forces Squadron | T | ----- | ----- | ----- |
| 349th Memorial Affairs Squadron | T | ----- | ----- | ----- |
| **349th Medical Group** | T | ----- | ----- | ----- |
| Command Section | T | ----- | ----- | ----- |
| 349 Medical Squadron | T | ----- | ----- | ----- |
| 349 Aeromedical Staging Squadron | T | ----- | ----- | ----- |
| 349 Contingency Hospital | T | ----- | ----- | ----- |
| **AMC Band of the Golden West** | T | ----- | ----- | ----- |
| **AMC Air Operations Squadron, Det 1 OL-A** | T | ----- | ----- | ----- |
| **Non-AMC Air Force Tenant Organizations** | | | | |
| 373rd Training Squadron, Det 14 | T | ----- | ----- | ----- |
| Air Force Audit Agency, Det 930 | T | ----- | ----- | ----- |
| 882nd Training Group Operation OL-PL14 | T | ----- | ----- | ----- |
| Air Force Civil Engineering OL-E | T | ----- | ----- | ----- |
| USAF Judge Area Defense Council | T | ----- | ----- | ----- |
| USAF Judge Western Circuit | T | ----- | ----- | ----- |
| On-Sight Inspection Agency | T | ----- | ----- | ----- |
| AF ELM MED USUHS ME OL-ANEW | T | ----- | ----- | ----- |
| AF Office of Special Investigation, Det 303 | T | ----- | ----- | ----- |
| OCA CE OL-CB (WSLO) | T | ----- | ----- | ----- |
| 59 Medical Wing OL-C | T | ----- | ----- | ----- |
| **Other DoD Tenant Organizations** | | | | |
| Defense Courier Service | T | ----- | ----- | ----- |
| DoD Civilian Personnel Management Service | T | ----- | ----- | ----- |
| Defense Reutilization and Marketing Office | T | ----- | ----- | ----- |
| Submarine Logistics Support Center, Det Travis | T | ----- | ----- | ----- |
| Fleet Air Reconnaissance Squadron (VQ3) Det Travis | T | ----- | ----- | ----- |
| Armed Service Whole Blood Processing Lab | T | ----- | ----- | ----- |
| Navy Transport Support Center | T | ----- | ----- | ----- |
| Defense Investigation Services | T | ----- | ----- | ----- |
| USA MEDDAC | T | ----- | ----- | ----- |
| Defense Commissary Agency | T | ----- | ----- | ----- |
| AAFES | T | ----- | ----- | ----- |
| **Non-DoD Tenant Organizations** | | | | |
| Immigration & Naturalization Service | T | ----- | ----- | ----- |
| US Customs | T | ----- | ----- | ----- |
| US Postal Service | T | ----- | ----- | ----- |
| US Dept of Agriculture | T | ----- | ----- | ----- |
| Royal Air Force Liaison | T | ----- | ----- | ----- |
| Red Cross | T | ----- | ----- | ----- |

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# Appendix D –

# Non-Labor Cost Functions

# Non-Labor Cost Functions

Non-labor cost functions are expressed either as a linear function (i.e., an equation) or as a step function (i.e., a table). In each table below the first and last columns are in bold print. For the cost item represented by the table, these columns describe the cost function (i.e., step function) used in the model. The first column is the independent variable in the cost function (e.g., base population, number of PCs), the last column is the dependent variable (i.e., dollars). The intervening, non-bolded, columns are intended to add understanding to how the cost function was derived.

## Communications Squadron

### 1. Information Systems Flight

A. System Administrator Training

annual marginal cost = ceiling(serviced pop / (# of PCs each administrator can serve)) * annual administrator cost * % administrators that are civs =

annual marginal cost = ceiling(sqdr pop / 50) * $2,500 * (.05)

B. e-mail server

| **e-mail server** (Assumption: 1 PC/person) | | |
|---|---|---|
| **PCs** | Mail Servers | **Money Saved/Yr** |
| **0 – 3,250** | 1 | **20,000** |
| **3,251 – 6,500** | 2 | **10,000** |
| **6,501 – 9,750** | 3 | **0** |
| **9,751 - 13,000** | 4 | **-10,000** |

C. Help Desk

| **Help Desk** | | | |
|---|---|---|---|
| **Population** | Manning | PCs & Supplies/3 Yrs | **Money Saved/Yr** |
| **0 – 8,000** | 2 | 2,000 + 225 | **741.67** |
| **8,001 – 12,000** | 3 | 0 | **0** |

## 2. Information Assurance Flight

A. Postage

Annual cost per civilian = annual postage costs for base / base population

$120,000/yr / 8,720 people = $13.76/person/yr

B. Mail Sorting Machine

| **Mail sorting machine** (Assumption: Squadrons incur costs in proportion to their population) | | | |
|---|---|---|---|
| **Population** | Mail Sorting Machines | Money Saved/Qtr | **Money Saved/Yr** |
| **0 – 6,500** | 1 | 2,359 | **9,436** |
| **6,500 – 17,000** | 2 | 0 | **0** |
| **17,000+** | 3 | -2,466 | **-9,864** |

C. Admin/Comm BITC (Base Information Transfer Center, i.e., mail)

| **Admin/Comm BITC (Base Info Transfer Center, i.e., mail)** | | | |
|---|---|---|---|
| **Population** | Manning | PCs & Supplies/3 Yrs | **Money Saved/Yr** |
| **0 – 1,500** | 4 | 10,000 + 1,125 | **3,708.33** |
| **1,501 – 3,000** | 5 | 8,000 + 900 | **2,966.67** |
| **3,001 – 4,500** | 6 | 6,000 + 675 | **2,225.00** |
| **4,501 – 6,000** | 7 | 4,000 + 450 | **1,483.33** |
| **6,001 – 7,500** | 8 | 2,000 + 225 | **741.67** |
| **7,501 – 9,000** | 9 | 0 | **0** |
| **9,001 – 10,500** | 10 | -2,000 - 225 | **-741.67** |

D. Computer Req/Warehouse

| **Comp Req/Warehouse** (Assumption: 1 PC/person) | | | |
|---|---|---|---|
| **PCs** | Manning | PCs & Supplies/3 Yrs | **Money Saved/Yr** |
| **0 – 2,500** | 2 | 6,000 + 675 | **2,225.00** |
| **2,501 – 5,000** | 3 | 4,000 + 450 | **1,483.00** |
| **5,001 – 7,500** | 4 | 2,000 + 225 | **741.67** |
| **7,501 – 10,000** | 5 | 0 | **0** |

## Services Squadron

1. **Fitness Center** – Equipment Cost + Laundry Cost = 1.42 + .26 = 1.68 ≅ $1.70/yr / civilian

   A. Equipment – Assumption: (1) Equipment has a four year lifespan, (2) 5% of users are DoD civilians.

   cost/civilian = (replacement price/4 yrs) / 4 * percent civilian use / civilian population

| Equipment | | | | |
|---|---|---|---|---|
| **Equipment** | Replacement Price/4 Yrs | Percent Civilian Use | Civilian Population | **Cost/Civilian** |
| Treadmills | 85,500 | | | |
| Recumbent Bikes | 30,000 | | | |
| Stair Steppers | 39,600 | | | |
| Cross Trainers | 33,000 | | | |
| **Total** | 188,100 | .05 | 1,652 | **1.42** |

Note: Free weights weren't included because they don't wear out.

B. Laundry

cost/civilian = annual cost * percent civilian use / civilian population

| Laundry | | | | |
|---|---|---|---|---|
| **Laundry Item** | Annual Cost | Percent Civilian Use | Civilian Population | **Cost/Civilian** |
| Detergent | 4,000 | | | |
| Bleach | 200 | | | |
| Fitness Wipes | 4,300 | | | |
| **Total** | 8,500 | .05 | 1,652 | **.26** |

## Security Forces Squadron

1. **Operations Flight** – annual cost per Operations Flight member

| Personal Security Equipment | | | |
|---|---|---|---|
| **Equipment** | Replacement Price | Lifespan of Equipment (Yrs) | **Annual Cost** |
| Bullet Proof Vest | 350 | 3 | 116.67 |
| Bianchi Gear | 200 | 7 | 28.58 |
| Mobility Gear | 500 | 3 | 166.67 |
| **Total** | | | **311.92** |

## Other Non-Labor Cost Functions

The cost functions for personnel (e.g., water, sewage), office supplies, personal computers (PC), and cubicle maintenance (e.g., electricity for PC, light, shared cost of printer, phone, and answering machine) for various organizations are listed below.

1. **Personnel Costs (e.g., water, sewage) were $34.15/year per authorization for each of the following organizations (i.e., organization cost = 34.15 * number of authorizations):**

   60th Air Mobility Wing's command section (CC), Staff Judge Advocate, Manpower and Quality Office, Public Affairs, Safety, Environmental Management, 60th Comptroller Sqdn, 60th Logistics Group CC, 60th Contracting Sqdn CC, Commodities Contracting Flt, Management Analysis Flt, Services Contracting Flt, contract administrators hired if CA is outsourced, 60th Supply Sqdn CC, Base Supply, 60th Transportation Sqdn, Combat Readiness and Resources Flt, Vehicle Operations Flt, 60th Operations Group CC, 60th Aerial Port Sqdn CC, Traffic Management Flt, 60th Support Group CC, 60th Civil Engineering Sqdn CC, Readiness Flt, 60th Communications Sqdn CC, Telecommunications Centers Element, Telephone Operations Element, C4 Systems Security, Planning and Implementation Flt, 60th Mission Support Sqdn CC, Civilian Personnel Office, 60th Services Sqdn CC, Child Development Center, 60th Security Forces Sqdn CC, Operations Flt, Administration and Reports Flt, Training and Resources Flt.

2. **Office Supplies were $100/year per authorization for each of the following organizations (i.e., organization cost = 100 * number of authorizations):**

   60th Air Mobility Wing's command section (CC), Staff Judge Advocate, Manpower and Quality Office, Public Affairs, Safety, Environmental Management, 60th Comptroller Sqdn, 60th Logistics Group CC, 60th Contracting Sqdn CC, Commodities Contracting Flt, Management Analysis Flt, Services Contracting Flt, contract administrators hired if CA is outsourced, 60th Supply Sqdn CC, Base Supply, 60th Transportation Sqdn, Combat Readiness and Resources Flt, 60th Operations Group CC, 60th Aerial Port Sqdn CC, 60th Support Group CC, 60th Civil Engineering Sqdn CC, Readiness Flt, 60th Communications Sqdn CC, Telecommunications Centers Element, Telephone Operations Element, C4 Systems Security, Planning and Implementation Flt, 60th Mission Support Sqdn CC, Civilian Personnel Office, 60th Services Sqdn CC, 60th Security Forces Sqdn CC, Operations Flt, Administration and Reports Flt, Training and Resources Flt.

**Office Supplies were $50/year per authorization for each of the following organizations (i.e., organization cost = 50 * number of authorizations):**

Vehicle Operations Flt, Traffic Management Flt, Child Development Center.

3. **Personal Computer (PC) costs were $666.67/year (i.e., PCs cost $2,000, but are purchased once every three years) per authorization for each of the following organizations (i.e., organization cost = 666.67 * number of authorizations):**

60th Air Mobility Wing's command section (CC), Staff Judge Advocate, Manpower and Quality Office, Public Affairs, Safety, Environmental Management, 60th Comptroller Sqdn, 60th Logistics Group CC, 60th Contracting Sqdn CC, Commodities Contracting Flt, Management Analysis Flt, Services Contracting Flt, contract administrators hired if CA is outsourced, 60th Supply Sqdn CC, 60th Transportation Sqdn CC, Combat Readiness and Resources Flt, 60th Operations Group CC, 60th Aerial Port Sqdn CC, 60th Support Group CC, 60th Civil Engineering Sqdn CC, Readiness Flt, 60th Communications Sqdn CC, Telecommunications Centers Element, Telephone Operations Element, C4 Systems Security, Planning and Implementation Flt, 60th Mission Support Sqdn CC, Civilian Personnel Office, 60th Services Sqdn CC, 60th Security Forces Sqdn CC, Administration and Reports Flt, Training and Resources Flt.

**Personal Computer (PC) costs were $500/year (i.e., three PCs for every four people) per authorization for each of the following organizations (i.e., organization cost = 500 * number of authorizations):**

Readiness Flt in 60th Civil Engineering Sqdn

**Personal Computer (PC) costs were $333.33/year (i.e., two people share a PC) per authorization for each of the following organizations (i.e., organization cost = 333.33 * number of authorizations):**

Base Supply in 60th Supply Sqdn

**Personal Computer (PC) costs were $222.22/year (i.e., three people share a PC) per authorization for each of the following organizations (i.e., organization cost = 222.22 * number of authorizations):**

Vehicle Operations Flt in 60th Transportation Sqdn, Traffic Management Flt in 60th Aerial Port Sqdn.

**Personal Computer (PC) costs were $166.67/year (i.e., four people share a PC) per authorization for each of the following organizations (i.e., organization cost = 166.67 * number of authorizations):**

Operations Flt in 60th Security Forces Sqdn

4. **Cubicle Costs (e.g., electricity for PC, light, shared cost of printer, phone, and answering machine) were $140/year per authorization for each of the following organizations (i.e., organization cost = 140 * number of authorizations):**

60th Air Mobility Wing's command section (CC), Staff Judge Advocate, Manpower and Quality Office, Public Affairs, Safety, Environmental Management, 60th Comptroller Sqdn, 60th Logistics Group CC, 60th Contracting Sqdn CC, Commodities Contracting Flt, Management Analysis Flt, Services Contracting Flt, contract administrators hired if CA is outsourced, 60th Supply Sqdn CC, Base Supply, 60th Transportation Sqdn, Combat Readiness and Resources Flt, Vehicle Operations Flt, 60th Operations Group CC, 60th Aerial Port Sqdn CC, 60th Support Group CC, 60th Civil Engineering Sqdn CC, 60th Communications Sqdn CC, Telecommunications Centers Element, Telephone Operations Element, C4 Systems Security, Planning and Implementation Flt, 60th Mission Support Sqdn CC, Civilian Personnel Office, 60th Services Sqdn CC, 60th Security Forces Sqdn CC, Administration and Reports Flt, Training and Resources Flt.

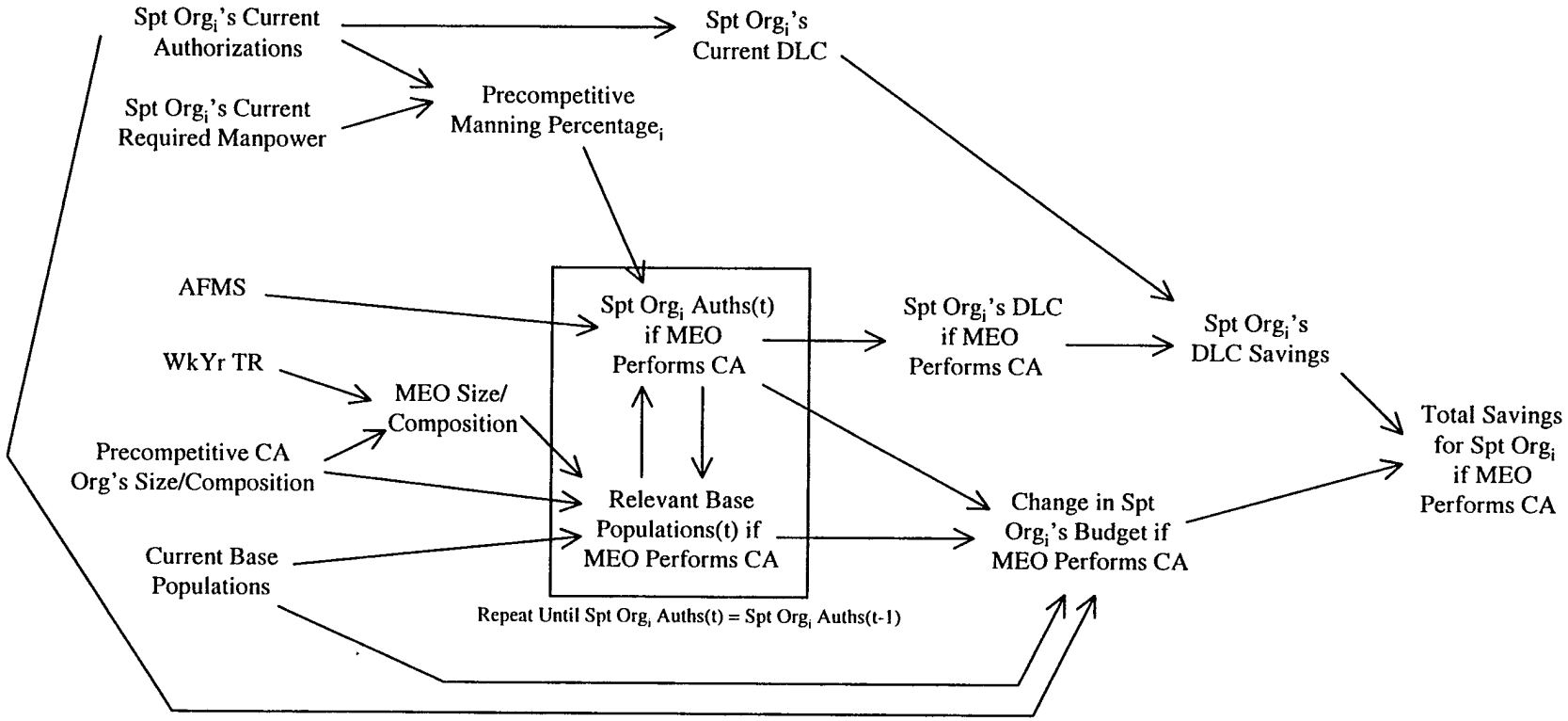
**Cubicle Costs (e.g., electricity for PC, light, shared cost of printer, phone, and answering machine) were $70/year per authorization for each of the following organizations (i.e., organization cost = 70 * number of authorizations):**

Readiness Flt in 60th Civil Engineering Sqdn

# Appendix E –

# Detailed Flowchart of Approach

# Figure E-1 - Flowchart to Estimate Savings for One Support Organization If MEO Performs CA




$$\text{Total Overhead Savings if MEO Performs CA} = \sum_{i=1}^{n} \text{Total Savings for Spt Org}_i \text{ if MEO Performs CA}$$

where n = number of support organizations

# Formulas for Figure E-1

1. **Precompetitive Manning Percentage$_i$** = Current Spt Org$_i$ Auths / Current Spt Org$_i$ Required Manpower

2. **Spt Org$_i$'s Current DLC** $= \sum_{j=1}^{m}$ (# of authorization type$_j$ in Current Spt Org$_i$) * DLC$_j$

   where m = # of authorization types = 83 (10 Officer + 9 Enlisted + 15 GS + 15 WG + 19 WS + 15 WL), and
   DLC$_j$ = DLC incurred by authorization type$_j$ (Example authorization types are: O-4. E-7, GS-7, WG-8, WS-5, and WL-9)

3. **MEO Size/Composition:**
   MEO Size = ceiling(Precompetitive CA Org size x WkYr TR)
   MEO Composition = zero Officers, zero Enlisted, (MEO Size) Civilians

4. **Spt Org$_i$ Auths(t) if MEO Performs CA** = ceiling(AFMS Required Manpower for Spt Org$_i$ * Precompetitive Manning Percentage$_i$)

5. **Relevant Base Populations(t) if MEO Performs CA** in time period t = 1

   Number of Officers(t) = Current Number of Officers on base(t-1) – Number of Officers in Precompetitive CA organization
   Number of Enlisted(t) = Number of Enlisted(t-1) – Number of Enlisted in Precompetitive CA organization
   Number of Civilians(t) = Number of Civilians(t-1) + (MEO Size - Number of Civilians in Precompetitive CA organization)

   **Relevant Base Populations(t) if MEO Performs CA** in time period t > 1

   Number of Officers(t) = Number of Officers(t-1) – Number of Spt Org Officers eliminated(t)
   Number of Enlisted(t) = Number of Enlisted(t-1) – Number of Spt Org Enlisted eliminated(t)
   Number of Civilians(t) = Number of Civilians(t-1) – Number of Spt Org Civilians eliminated(t)

   Time period 1 (i.e., t=1) lasts from MEO implementation until the base Manpower Office performs a price-out (i.e., applies the AFMSs to determine support organization authorization requirements). Each time period after that (i.e., t > 1) is the length of time between one price-out and the next, usually one to two years.

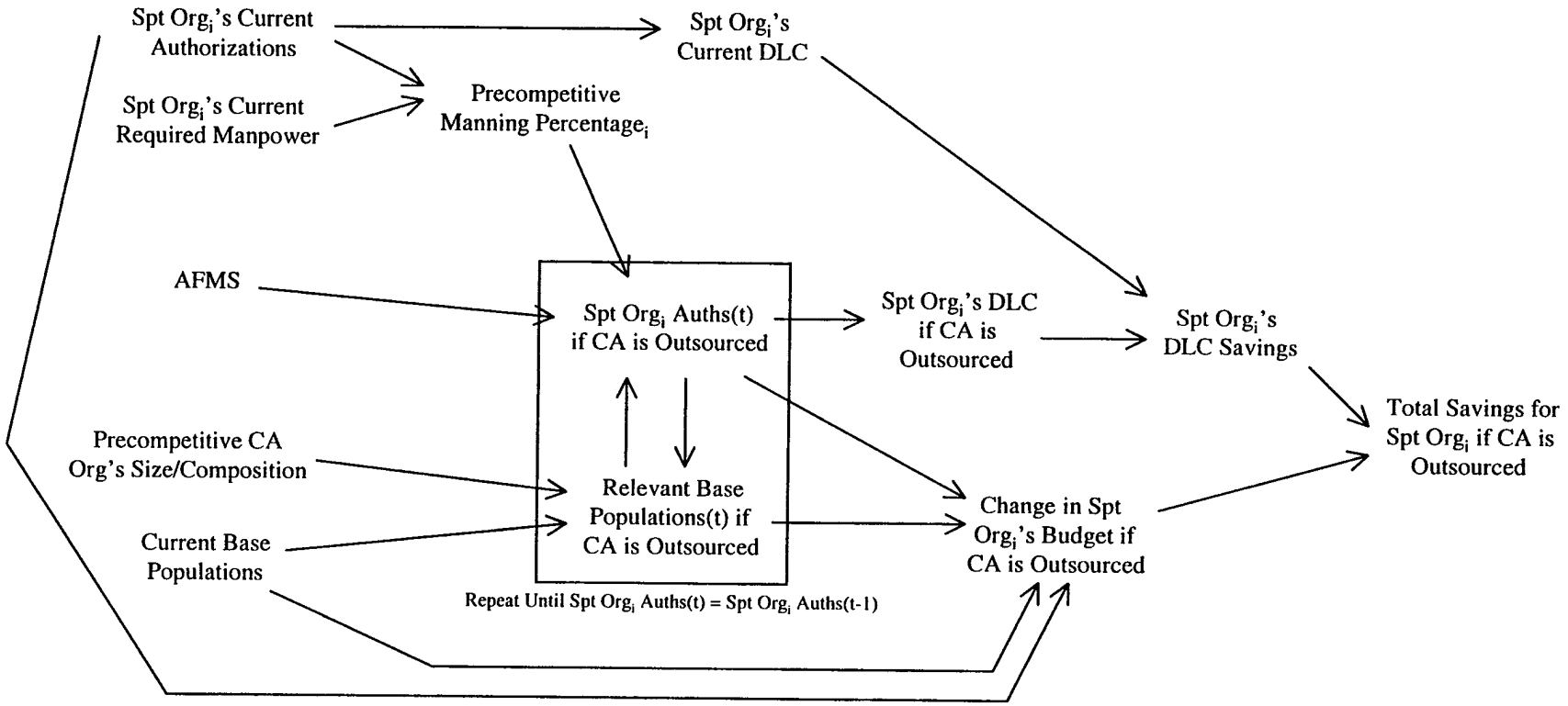
6. **Spt Org$_i$'s DLC if MEO Performs CA** $= \sum_{j=1}^{m}$ (# of authorization type$_j$ in Spt Org$_i$ if MEO Performs CA) * DLC$_j$

7. **Change in Spt Org$_i$'s Budget if MEO Performs CA** = the appropriate cost functions, obtained through interviews, are applied

8. **Spt Org$_i$'s DLC Savings** = Spt Org$_i$'s Current DLC - Spt Org$_i$'s DLC if MEO Performs CA

9. **Total Savings for Spt Org$_i$ if MEO Performs CA** = Spt Org$_i$'s DLC Savings + Change in Spt Org$_i$'s Budget if MEO Performs CA

# Figure E-2 - Flowchart to Estimate Savings for One Support Organization If CA is Outsourced




$$\text{Total Overhead Savings if CA is Outsourced} = \sum_{i=1}^{n} \text{Total Savings for Spt Org}_i \text{ if CA is Outsourced}$$

where n = number of support organizations

# Formulas for Figure E-2

1. **Precompetitive Manning Percentage$_i$** = Current Spt Org$_i$ Auths / Current Spt Org$_i$ Required Manpower

2. **Spt Org$_i$'s Current DLC** $= \sum_{j=1}^{m}$ (# of authorization type$_j$ in Current Spt Org$_i$) * DLC$_j$

   where m = # of authorization types = 83 (10 Officer + 9 Enlisted + 15 GS + 15 WG + 19 WS + 15 WL), and
   DLC$_j$ = DLC incurred by authorization type$_j$ (Example authorization types are: O-4. E-7, GS-7, WG-8, WS-5, and WL-9)

3. **Spt Org$_i$ Auths(t) if CA is Outsourced** = ceiling(AFMS Required Manpower for Spt Org$_i$ * Precompetitive Manning Percentage$_i$)

4. **Relevant Base Populations(t) if CA is Outsourced** in time period t = 1

   Number of Officers(t) = Current Number of Officers on base(t-1) – Number of Officers in Precompetitive CA organization
   Number of Enlisted(t) = Number of Enlisted(t-1) – Number of Enlisted in Precompetitive CA organization
   Number of Civilians(t) = Number of Civilians(t-1) – Number of Civilians in Precompetitive CA organization

   **Relevant Base Populations(t) if CA is Outsourced** in time period t > 1

   Number of Officers(t) = Number of Officers(t-1) – Number of Spt Org Officers eliminated(t)
   Number of Enlisted(t) = Number of Enlisted(t-1) – Number of Spt Org Enlisted eliminated(t)
   Number of Civilians(t) = Number of Civilians(t-1) – Number of Spt Org Civilians eliminated(t)

   Time period 1 (i.e., t=1) lasts from CA outsourcing until the base Manpower Office performs a price-out (i.e., applies the AFMSs to determine support organization authorization requirements). Each time period after that (i.e., t > 1) is the length of time between one price-out and the next, usually one to two years.

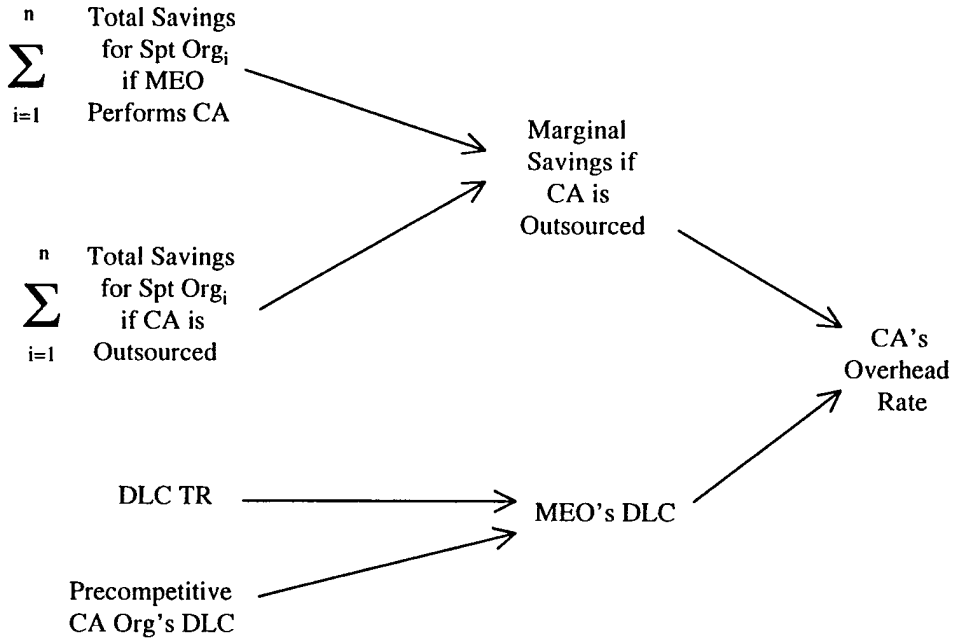
5. **Spt Org$_i$'s DLC if CA is Outsourced** $= \sum_{j=1}^{m}$ (# of authorization type$_j$ in Spt Org$_i$ if CA is Outsourced) * DLC$_j$

6. **Change in Spt Org$_i$'s Budget if CA is Outsourced** = the appropriate cost functions, obtained through interviews, are applied

7. **Spt Org$_i$'s DLC Savings** = Spt Org$_i$'s Current DLC - Spt Org$_i$'s DLC if CA is Outsourced

8. **Total Savings for Spt Org$_i$ if CA is Outsourced** = Spt Org$_i$'s DLC Savings + Change in Spt Org$_i$'s Budget if CA is Outsourced

# Figure E-3 - Flowchart to Estimate CA's OHR



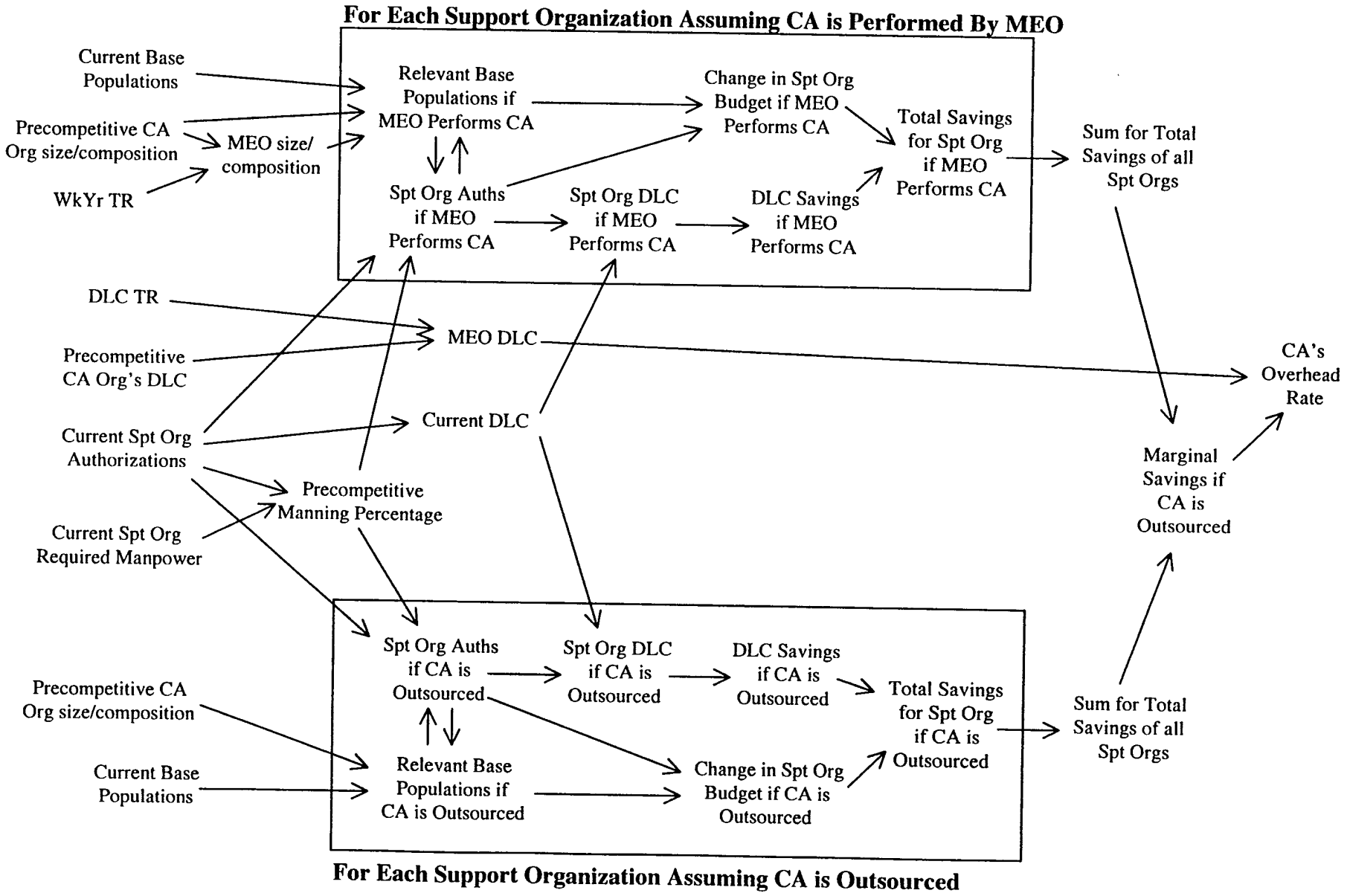

**1. n** = number of support organizations

**2. Marginal Savings if CA is Outsourced** = (ΣTotal Savings for Spt Org$_i$ if MEO Performs CA) - (ΣTotal Savings for Spt Org$_i$ if CA is Outsourced)

**3. MEO's DLC** = Precompetitive CA Org's DLC * DLC TR

**4. CA's Overhead Rate** = Marginal Savings if CA is Outsourced / MEO's DLC

# Figure E-4 - "Big Picture" Flowchart of Approach



# Appendix F –

# Non-Labor Budget Questionnaire

# Non-Labor Budget Questionnaire

Date_____

Authorization: This questionnaire has been approved for distribution on Travis AFB by Brigadier General Steven A. Roser, 60 AMW/CC.

Purpose: The objective of this study is to determine overhead costs associated with various base activities. The purpose of this questionnaire is to learn how your organization's resource requirements (labor & non-labor) would change if base activities are outsourced.

1. Unit or Organization name: _____

2. POC/Phone number/e-mail: _____

3. What are your main products/services? _____

   _____

   _____

4. Who are your main customers? Are they a type of person or a type of organization?

| Type of Person | Percent of Workload | Type of Organization | Percent of Workload |
|---|---|---|---|
| Officers | _____ | _____ | _____ |
| Enlisted | _____ | _____ | _____ |
| DoD Civilians | _____ | _____ | _____ |
| Non-DoD Civilians | _____ | _____ | _____ |

5. What metrics do you use to measure the quantity of work you perform? _____

   _____

6. Using the metrics mentioned in Q5 above, how much work does your organization perform each year? _____

   _____

   _____

7. How do changes in the military population on base affect your workload? _____

   _____

   _____

   _____

# Non-Labor Budget Questionnaire

Date_____

8. How do changes in the civilian population on base affect your workload? _____

_____

_____

_____

9. How do changes in the contractor population on base affect your workload? _____

_____

_____

_____

10. What was your non-labor budget last year (FY98)?_____

This year (FY99)?_____

11. What drove the change?_____

_____

12. How do changes in your workload affect your budget? _____

_____

_____

_____

_____

13. How does your organization decide on next year's non-labor budget request? _____

_____

_____

_____

_____

# Appendix G –

# Illustrative Example of Model Operation and Sensitivity Analyses

# An Illustrative Example of Model Operation

To clarify how the model works and the modeling process, a step-by-step description of how the model was setup and operated is presented here. For the sake of simplicity, assume the base has two CAs: the Fuels Management Flight in the Supply Squadron, and the Base Network Control Center in the Communications Squadron. Also for the sake of simplicity, assume the base has only four support organizations: the Vehicle Operations Flight, the Services Contracting Flight, the Manpower and Quality Office, and the Civilian Personnel Office. Assume further that the Fuels Management Flight (FMF) currently has one officer, 82 enlisted, and 9 civilian authorizations incurring total DLC of $3,879,375, and the Base Network Control Center (BNCC) currently has one officer, 32 enlisted, and 3 civilian authorizations incurring total DLC of $1,716,611. For the purpose of this example, the work year, budget, and DLC transformation rates assumed will be .75, 1.0, and .75, respectively.

This example will be presented in three parts. Part 1 (section G.1) will estimate the OHR for the FMF, part 2 (section G.2) will estimate the OHR for the BNCC, and part 3 (section G.3) will estimate the OHR for a CA consisting of both the FMF and BNCC.

## G.1 Calculating the Overhead Rate for the Fuels Management Flight (FMF)

### Setting Up the Model

Before running the model, the user is required to enter the following data: (1) the number of officer, enlisted, and civilian authorizations in the precompetitive CA, by squadron, (2) the precompetitive CA's DLC, and (3) the work year, budget, and DLC transformation rates to be used during the run. All other required data (e.g., each support organization's AFMS equation and current authorizations) are already in the model.

Model Operations

The model computes the CA's overhead rate by executing the following 14 steps.

**Step 1 – Calculate the MEO's DLC.** This is accomplished by multiplying the CA's precompetitive DLC by the DLC transformation rate. The result, $DLC_{MEO}$, will be the denominator in the formula that computes the CA's overhead rate: $OHR = \Delta OHC / DLC_{MEO}$. Using the example data, the Fuels Management Flight's DLC = 3,879,375 and the DLC TR = .75, so:

$$DLC_{MEO} = 3,879,375 \times .75 = 2,909,531.25$$

**Step 2 – Calculate the precompetitive manning percentage for all support organizations.** As mentioned earlier, this example assumes the base has four support organizations. An AFMS determines required manning in one of three ways: (1) a linear equation yielding man-hours per month, (2) a linear equation yielding manpower, or (3) a matrix yielding manpower. The Vehicle Operations Flight is of the first type, the Services Contracting Flight is of the second type, and the Manpower and Quality Office is of the third type. The Civilian Personnel Office is also of the second type, but because of its unique nature, it is being included to illustrate how the OHR for the CA is calculated, including avoided costs and not including avoided costs.

A) The Vehicle Operations Flight in the Transportation Squadron will be used as a representative case for all organizations with an AFMS that uses a linear equation that yields required man-hours per month.

The Vehicle Operations Flight's AFMS is Y = 1,232.91 + 1.01X, where Y = the required man-hours per month and X = the relevant base population (e.g., the sum of all active duty and DoD civilian authorizations in all Air Force units on base). Assume the relevant base population was 8,428 prior to MEO construction. Applying the AFMS man-hour equation, the Vehicle Operations Flight requires enough personnel to perform 1,232.91 + 1.01(8,428) = 9,745.19 man-hours of work per month.

Assume this support organization had 46 military and 9 civilian authorizations prior to MEO construction. Using the peacetime military man-hour availability factor of 163.2 hours per month for military authorizations and the peacetime civilian man-hour availability factor of 147 hours per month for civilian authorizations, the precompetitive organization was authorized a level of manning that produced (46 x 163.2) + (9 x 147) = 8,830.2 man-hours per month. Consequently, the organization was undermanned by 9,745.19 – 8,830.2 = 914.99 man-hours per month (i.e., the difference between required man-hours and authorized man-hours). Converting the man-hour shortfall into a manning shortfall, the Vehicle Operations Flight was undermanned by 914.99 / 163.2 = 5.6 ≈ 6 authorizations according to the AFMS.[4]

The organization's precompetitive manning percentage was then computed by dividing the precompetitive number of authorized personnel by the precompetitive required manning:

(46 mil + 9 civ) / (46 mil + 9 civ + 6 shortfall) = 55 / 61 = .90, or 90 percent manned

B) The Services Contracting Flight in the Transportation Squadron will be used as a representative case for all organizations with an AFMS that uses a linear equation that yields required manning.

The Services Contracting Flight's AFMS is Y = 5 + .0004712X, where Y = the required manning and X = the relevant base population (e.g., the sum of all active duty, DoD civilian authorizations, and CMEs in all Air Force units on base). Assume the relevant base population was 9,163 prior to MEO construction. Applying the AFMS manpower equation, the Services Contracting Flight requires 5 + .0004712(9,163) = 9.32 ≈ 10 personnel.

Assume this support organization had 10 military and 14 civilian authorizations prior to MEO construction. Then the precompetitive organization is over-manned by 14 authorizations (i.e., the difference between required manpower and authorized manpower). The organization's precompetitive manning percentage was then computed by dividing the precompetitive number of authorized personnel by the precompetitive required manning:

(10 mil + 14 civ) / 10 = 2.4, or 240 percent manned

[4] Because it is more difficult to obtain new civilian authorizations than new military authorizations, the shortfall in man-hours was always divided by the military man-hour availability factor (i.e., 163.2) rather than the civilian man-hour availability factor (i.e., 147).

C) The Manpower and Quality Office will be used as a representative case for all organizations with an AFMS that uses a matrix to determine required manning. Because the actual matrix in the AFMS is fairly large and complex, the notional matrix below will be used throughout this example.

| Relevant Base Population | 1,000-2,999 | 3,000-4,999 | 5,000-8,999 | 9,000-11,999 | 12,000-15,000 |
|---|---|---|---|---|---|
| Manpower Office Manning | 4 | 5 | 7 | 9 | 11 |

Assume the relevant base population was 9,040 prior to MEO construction. Looking up 9,040 in the matrix yields a required manning of 9 personnel. Also assume that this support organization had 5 military and 2 civilian authorizations prior to MEO construction. Then the precompetitive organization is undermanned by 2 authorizations (i.e., the difference between required manning and authorized manning). The organization's precompetitive manning percentage was then computed by dividing the precompetitive number of authorized personnel by the precompetitive required manning.

$$(5 + 2) / 9 = .77, \text{ or } 77 \text{ percent manned}$$

D) The Civilian Personnel Office does not have a published AFMS like all other support functions. However, since Air Force policy is to attain and maintain a ratio of one Civilian Personnel Office authorization to 88 DoD civilian authorizations by the end of FY2001, the manning equation used was Y = 1/88X, where Y = the required manning and X = the relevant base population (e.g., DoD civilian authorizations).[5] Because this is a manpower equation, it is treated the same way the Services Contracting Flight's manning equation is treated.

Assuming the relevant base population prior to MEO construction was 1,595, then the CPO would require (1 / 88)(1,595) = 18.3 ≈ 19 personnel. Assuming further that the Civilian Personnel Office had 19 authorizations prior to MEO construction, then its precompetitive manning percentage is:

19 / 19 = 1.0, or 100 percent manned

**Step 3 – Compute size of the MEO.** The MEO size is computed by multiplying the precompetitive organization's authorizations by the work year transformation rate. Fractions of authorizations are rounded up to the nearest whole authorization.

FMF MEO Size = (1 Officer + 82 Enlisted + 9 Civilian) * .75 = 91 * .75 = 69 authorizations

**Step 4 – Convert all military authorizations in the CA to civilian authorizations and adjust the squadron and base populations accordingly.** The total number of officer, enlisted, and civilian authorizations in the Supply Squadron and on base will be modified as follows:

| | Officer | Enlisted | Civilian |
|---|---|---|---|
| FMF (Supply Sqdn) | -1 | -82 | +60 |

[5] DoD (i.e., Air Force, Army, Navy, and the Defense Logistics Agency) is currently implementing a regionalization and modernization effort for the civilian personnel records system. DoD's goal is to attain a 1:88 ratio by the end of FY2001. (McCullar 1998) According to the Palace Compass Program Management Office (AF/DPFZ), which is the Air Staff office that manages the Air Force's civilian personnel regionalization and systems modernization effort, the current ratio is approximately 1:71. In accordance with the long-run approach to this research, the manning equation used in this model assumed a 1:88 ratio. If this goal is not met, the result (compared to those presented here) will be to increase the rate at which the Civilian Personnel Office loses or gains authorizations when the base's DoD civilian population falls or rises (i.e., the slope of its manpower equation will be steeper). Consequently, DLC and budget savings realized by the Civilian Personnel Office as a result of outsourcing will accrue more quickly and, therefore, will cause the OHR to rise. This will be the case whether the OHR is calculated including or not including avoided costs.

Even though the total number of authorizations in the squadron and on base will decrease as a result of implementing the MEO, the number of civilian authorizations will increase by 60. By converting all military authorizations to civilian authorizations, the number of officer and enlisted authorizations in the CA will fall to zero (i.e., decrease by the total number in the precompetitive organization), but the number of civilian authorizations will increase by the difference between the MEO size and the precompetitive number of civilian authorizations. Consequently, if the precompetitive organization has fewer civilian authorizations than the MEO size, the number of civilian authorizations in the squadron and on base will increase as a result of constructing an MEO. Of course, if the precompetitive organization has more civilian authorizations than the size of the MEO, the number of civilian authorizations will decrease, just as the officer and enlisted populations did.

**Step 5 – Determine the effect on support organization manning given the change in base populations (i.e., implementing the MEO).** For each support organization this is accomplished by using the organization's AFMS and its precompetitive manning percentage.

A) The Vehicle Operations Flight's AFMS man-hour equation and its precompetitive manning percentage are used to compute the number of authorizations it would have if the MEO performs the CA. First, the model recomputes the required man-hours with the new relevant base population. It then converts the man-hours to manning, then multiplies the new required manning by the precompetitive manning percentage to obtain the new number of authorizations. All calculations are below.

New relevant base population: 8,428 – 1 officer – 82 enlisted + 60 civilians = 8,405

New number of required man-hours: 1,232.91 + 1.01(8,405) = 9,721.96 man-hours of work required per month

New number of required personnel:

(9 x 147) = 1,323 man-hours performed by civilians

(9,721.96 – 1,323 = 8,398.96 man-hours per month to be performed by military personnel

8,398.96 / 163.2 = 51.46 ≈ 52 required military personnel

So a total of (9 civ + 52 mil) = 61 people are required.

New number of authorizations: 61 x .90 = 54.9 ≈ 55 authorizations

In this case, the new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Vehicle Operations Flight by implementing the Fuels Management Flight's MEO.

B) The Services Contracting Flight's AFMS manpower equation and its precompetitive manning percentage are used to compute the number of authorizations it would have if the MEO performs the CA. The model first recomputes the required manning with the new relevant base population. It then multiplies the new required manning by the precompetitive manning percentage to obtain the new number of authorizations. All calculations are below.

New relevant base population: 9,163 – 1 officer – 82 enlisted + 60 civilians = 9,140
New number of required personnel: 5 + .0004712(9,140) = 9.31 ≈ 10 personnel
New number of authorizations: 10 x 2.4 = 24 authorizations

In this case, the new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Services Contracting Flight by implementing the Fuels Management Flight's MEO.

C) The Manpower and Quality Office's AFMS manning matrix and its precompetitive manning percentage are used to determine its new required manning. Using the new relevant base population of 9,017 (i.e., 9,040 – 1 – 82 + 60) and the same notional matrix as was used earlier, the new number of required personnel is 9.

| Relevant Base Population | 1,000-2,999 | 3,000-4,999 | 5,000-8,999 | 9,000-11,999 | 12,000-15,000 |
|---|---|---|---|---|---|
| Manpower Office Manning | 4 | 5 | 7 | 9 | 11 |

As was done with the other support organizations, the new number of required personnel is then multiplied by the precompetitive manning percentage to yield the new number of authorizations.

$$9 * .77 = 7 \text{ authorizations}$$

In this case, the new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Manpower and Quality Office by implementing the Fuels Management Flight's MEO.

D) The Civilian Personnel Office's authorized manpower is computed following the same procedures that were used when computing the Services Contracting Flight's.

New relevant base population: 1,595 + 60 civilians = 1,655
New number of required personnel: (1 / 88)(1,655) = 18.81 ≈ 19 personnel
New number of authorizations: 19 x 1.0 = 19 authorizations

In this case, the new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings or additional costs from the Civilian Personnel Office by implementing the Fuels Management Flight's MEO.

At this point, had there been changes in support organization population, base populations would be modified to reflect those changes and this step would be repeated for all support organizations using the modified base populations. This repetitive process of calculating support organization authorizations, modifying base population, and recalculating support organization authorizations again is repeated until no support organizations have a change in authorizations.

**Step 6 – Determine the effect on support organization DLC given the change in manning (i.e., implementing the MEO).** In this case, since there was no change in support organization manning as a result of the decrease in base population, there will be no change in support organization DLC.

**Step 7 – Determine the effect on support organization budget requirements given the changes in manning and base populations (i.e., implementing the MEO).** None of these organizations' work load or budget requirements are dependent directly on base population. They are affected only by its mission and the number of authorizations in the organization. Consequently, since there was no change in support organization manning and it was assumed that missions remain constant, there will be no change in support organization budget requirements if the MEO is implemented.

**Step 8 – Determine total change in base overhead costs if the MEO is implemented.** The sum of the changes in support organization DLCs and budget requirements is calculated. In this case, since there was no change in support organization DLC or budget requirements, the total change in base overhead costs by implementing the MEO will be zero. This means that base overhead costs with respect to the CA will be the same if the MEO is implemented or if the precompetitive organization continues performing the activity (i.e., direct costs to the CA may be reduced, but not overhead costs).

**Step 9 – Outsource the CA.** The model simulates outsourcing the CA by converting all the civilian authorizations in the MEO to CME authorizations (i.e., reducing the number of civilian authorizations in the Supply Squadron and on base by the size of the MEO, and increasing the number of CME authorizations by the same amount). The total number of civilian and CME authorizations in the Supply Squadron and on base will be modified as follows:

| | Civilian | CME |
|---|---|---|
| FMF (Supply Sqdn) | -69 | +69 |

**Step 10 – Determine the effect on support organization manning given the change in base populations (i.e., outsourcing the CA).** The procedures are the same as in step 5, above, only with the new relevant base population. Once again, each support organization's AFMS and precompetitive manning percentage are used.

A) The computations to determine the change in the number of authorizations in the Vehicle Operations Flight as a result of outsourcing the FMF are as follows:

New relevant base population: 8,405 - 69 = 8,336

New number of required man-hours: 1,232.91 + 1.01(8,336) = 9,652.27 man-hours of work required per month

New number of required personnel:

(9 x 147) = 1,323 man-hours performed by civilians

(9,652.27 – 1,323 = 8,329.27 man-hours per month to be performed by military personnel

8,329.27 / 163.2 = 51.04 ≈ 52 required military personnel

So a total of (9 + 52) = 61 people are required.

New number of authorizations: 61 x .90 = 54.9 ≈ 55 authorizations

In this case, the new number of authorizations is equal to the precompetitive number of authorizations so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Vehicle Operations Flight if the Fuels Management Flight is outsourced.

B) The computations to determine the change in the number of authorizations in the Services Contracting Flight as a result of outsourcing the FMF are as follows:

New relevant base population: 9,140 - 69 = 9,071

New number of required personnel: 5 + .0004712(9,071) = 9.27 ≈ 10 personnel

New number of authorizations: 10 x 2.4 = 24 authorizations

In this case, the new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Services Contracting Flight if the Fuels Management Flight is outsourced.

C) The Manpower and Quality Office's relevant base population as a result of the FMF being outsourced is 8,948 (i.e., 9,017 – 69). The notional manning matrix indicates the Manpower and Quality Office's new number of required personnel is 7.

| Relevant Base Population | 1,000-2,999 | 3,000-4,999 | 5,000-8,999 | 9,000-11,999 | 12,000-15,000 |
|---|---|---|---|---|---|
| Manpower Office Manning | 4 | 5 | 7 | 9 | 11 |

Multiplying the new number of required personnel by the precompetitive manning percentage yields the new number of authorizations.

$$7 * .77 = 5.39 \approx 6 \text{ authorizations}$$

In this case, the new number of authorizations is one less than the number of authorizations if the MEO were implemented, so the model eliminates one authorization from the Manpower and Quality Office.

D) The computations to determine the change in the number of authorizations in the Civilian Personnel Flight as a result of outsourcing the FMF are as follows:

New relevant base population: 1,655 - 69 = 1,586

New number of required personnel: (1 / 88)(1,586) = 18.02 ≈ 19 personnel

New number of authorizations: 19 x 1.0 = 19 authorizations

In this case, the new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings or additional costs from the Civilian Personnel Office if the Fuels Management Flight is outsourced.

Since total support organization population has been reduced by one authorization, base populations are modified to reflect the change and this step is repeated for all support

organizations using the modified base population. The modified relevant base populations are 8,335; 9,070; 8,947; and 1,586,[6] respectively. This reduction of one authorization does not cause any of the support organizations to lose another authorization, so this step is complete.

**Step 11 – Determine the effect on support organization DLC given the change in manning (i.e., outsourcing the CA).** In this case, there was no change in manning in the Vehicle Operations Flight, Services Contracting Flight, or Civilian Personnel Office, but there was one authorization eliminated from the Manpower and Quality Office. Since the particular authorization eliminated affects the DLC saved and, in turn, the overhead rate, the model uses six different algorithms to estimate the reduction in DLC. Upon analysis of the output the researcher can see how sensitive the results are to the authorization-elimination algorithm used.

The six different algorithms are all the possible combinations of two variables: (1) type of authorization (i.e., military vs. civilian) eliminated, and (2) rank/grade of eliminated authorization. The variables have 2 and 3 treatment levels, respectively. The treatment levels for type of authorization are: (1) to eliminate all available military authorizations before eliminating any civilian authorizations (Retain Civilian, or Ret Civ), and (2) to eliminate all available civilian authorizations before eliminating any military authorizations (Retain Military, or Ret Mil). When eliminating a military authorization, the model will eliminate all enlisted authorizations before eliminating an officer authorization. The treatment levels for rank/grade of eliminated authorization are: (1) weighted average (Wtd Avg) of type of eliminated authorization (i.e., officer, enlisted, civilian), (2) lowest rank for military and lowest DLC for civilian authorization eliminated (Lo), and (3) highest rank for military and highest DLC for civilian authorization eliminated (Hi).

Enumerating the six algorithms, they are: (1) retain civilian, reduce DLC by weighted average of type of authorization eliminated (Ret Civ – Wtd Avg), (2) retain civilian, reduce DLC by lowest rank/DLC (Ret Civ – Lo), (3) retain civilian, reduce DLC by highest

[6] The Civilian Personnel Office's relevant base population of 1,586 assumes a military authorization was eliminated from the Manpower and Quality Office. Since the Civilian Personnel Office's workload factor is base civilian population, it's not affected by the eliminated authorization. If the eliminated authorization is a civilian authorization, then the modified relevant base population for the Civilian Personnel Office would be 1,585. In neither case would the Civilian Personnel Office lose an authorization.

rank/DLC (Ret Civ – Hi), (4) retain military, reduce DLC by weighted average of type of authorization eliminated (Ret Mil – Wtd Avg), (5) retain military, reduce DLC by lowest rank/DLC (Ret Mil – Lo), (6) retain military, reduce DLC by highest rank/DLC (Ret Mil – Hi). The base-case (i.e., the case assumed most likely to happen in reality) estimate of what the reduction in DLC will be in real life is the Ret Civ – Wtd Avg algorithm. All six of these algorithms are computed both including and not including avoided costs.

Assume the seven authorizations in the precompetitive Manpower and Quality Office that supported the Fuels Management precompetitive organization are a Captain (DLC = 83,866), a MSgt (DLC = 62,730), 2 SSgt (DLC = 47,586 each), a SrA (DLC = 40,181), a GS-11 (DLC = 64,250), and a GS-4 (DLC = 31,321). This means the DLC for the Manpower and Quality Office are $377,520 (i.e. 83,866 + 62,730 + 2 x 47,586 + 40,181 + 64,250 + 31,321). Calculations for each of the six algorithms are below.

A) Ret Civ – Wtd Avg (The Base-Case Algorithm):

Weighted Average of Enlisted Authorization = (62,730 + 2 x 47,586 + 40,181) / 4 = 49,520

Reduction in DLC = # of authorizations eliminated x Wtd Avg = 1 x 49,520 = 49,520

B) Ret Civ – Lo:

Order of Authorizations, Military First, by Rank/Grade, from Lowest to Highest:

SrA, SSgt, SSgt, MSgt, Capt, GS-4, GS-11

Corresponding DLC for the Ranks/Grades listed above:

40,181; 47,586; 47,586; 62,730; 83,866; 31,321; 64,250

Reduction in DLC = $\Sigma$ of first n DLCs, where n = # of eliminated authorizations = 40,181

C) Ret Civ – Hi:

Order of Authorizations, Military First, by Rank/Grade, from Highest to Lowest:

Capt, MSgt, SSgt, SSgt, SrA, GS-11, GS-4

Corresponding DLC for the Ranks/Grades listed above:

83,866; 62,730; 47,586; 47,586; 40,181; 64,250; 31,321

Reduction in DLC = $\Sigma$ of first n DLCs, where n = # of eliminated authorizations = 83,866

D) Ret Mil – Wtd Avg:

Weighted Average of Civilian Authorization = (64,250 + 31,321) / 2 = 47,785.50

Reduction in DLC = # of authorizations eliminated x Wtd Avg = 1 x 47,785.50 = 47,785.50

E) Ret Mil – Lo:

Order of Authorizations, Civilian First, by Grade/Rank, from Lowest to Highest:

GS-4; GS-11; SrA, SSgt, SSgt, MSgt, Capt

Corresponding DLC for the Grades/Ranks listed above:

31,321; 64,250; 40,181; 47,586; 47,586; 62,730

Reduction in DLC = $\Sigma$ of first n DLCs, where n = # of eliminated authorizations = 31,321

F) Ret Mil – Hi:

Order of Authorizations, Civilian First, by Grade/Rank, from Highest to Lowest:

GS-11, GS-4, Capt, MSgt, SSgt, SSgt, SrA,

Corresponding DLC for the Grades/Ranks listed above:

64,250; 31,321; 83,866; 62,730; 47,586; 47,586; 40,181

Reduction in DLC = $\Sigma$ of first n DLCs, where n = # of eliminated authorizations = 64,250

**Step 12 – Determine the effect on support organization budget requirements given the changes in manning and base populations (i.e., outsourcing the CA).** Again, since the Vehicle Operations Flight, Services Contracting Flight, and Civilian Personnel Office did not have a change in authorizations and because these organizations' work loads and budget requirements are not directly dependent on base population, these organizations' budget requirements will not change.

However, the reduction of one authorization in the Manpower and Quality Office will reduce its budget requirements. The office will require fewer office supplies, will not have to purchase a new PC to replace the eliminated person's PC, and there will be one less person using a cubicle and facilities (i.e., electricity for the PC, water, sewage). Therefore, the model reduces the Manpower and Quality Office's budget requirements by the sum of these costs. In the Manpower and Quality Office's case, the reduction in budget requirements for one authorization is estimated to be $940.82 per year.

The changes in all support organization budget requirements are summed to estimate the total change in support organization budget requirements if the Fuels Management Flight is outsourced.

**Step 13 – Determine total change in base overhead costs if the CA is outsourced.** The sum of the changes in support organization DLC and budget requirements is calculated to obtain the estimate of the total overhead savings that would result if the CA is outsourced. For sensitivity analysis purposes, the model computes six OHRs corresponding to the six authorization-elimination algorithms. Calculations for the six algorithms are below. Since there were no DLC or budget changes for the Vehicle Operations and Services Contracting Flights, they will be ignored in the calculations.

A) Ret Civ – Wtd Avg (The Base-Case Algorithm):

Change in Overhead Costs = (Reduction in DLC + Reduction in Budget Req'ts) =

$$49{,}520 + 940.82 = 50{,}460.82$$

B) Ret Civ – Lo:

Change in Overhead Costs = Reduction in DLC + Reduction in Budget Req'ts =

$$40{,}181 + 940.82 = 41{,}121.82$$

C) Ret Civ – Hi:

Change in Overhead Costs = Reduction in DLC + Reduction in Budget Req'ts =

$$83{,}866 + 940.82 = 84{,}806.82$$

D) Ret Mil – Wtd Avg:

Change in Overhead Costs = Reduction in DLC + Reduction in Budget Req'ts =

$$47{,}785.50 + 940.82 = 48{,}726.32$$

E) Ret Mil – Lo:

Change in Overhead Costs = Reduction in DLC + Reduction in Budget Req'ts =

$$31{,}321 + 940.82 = 32{,}261.82$$

F) Ret Mil – Hi:

Change in Overhead Costs = Reduction in DLC + Reduction in Budget Req'ts =

$$64{,}250 + 940.82 = 65{,}190.82$$

Since the Civilian Personnel Office would not have gained an authorization if the MEO were implemented, these reductions in OHCs are the same whether the savings are computed including avoided costs (SIAC) or not including avoided costs (SNIAC).

**Step 14 – Calculate the CA's overhead rate.** The formula used to calculate the overhead rate is $OHR = \Delta OHC / DLC_{MEO}$. Plugging in the values for the six different authorization-elimination algorithms, the overhead rate(s) for the Fuels Management Flight is estimated to be:

A) Ret Civ – Wtd Avg (The Base-Case Algorithm):

Overhead Rate = Change in Overhead Costs / $DLC_{MEO}$ =

= 50,460.82 / 2,909,531.25 = .0173 = 1.73 percent overhead rate

B) Ret Civ – Lo:

Overhead Rate = Change in Overhead Costs / $DLC_{MEO}$ =

= 41,121.82 / 2,909,531.25 = .0141 = 1.41 percent overhead rate

C) Ret Civ – Hi:

Overhead Rate = Change in Overhead Costs / $DLC_{MEO}$ =

= 84,806.82 / 2,909,531.25 = .0291 = 2.91 percent overhead rate

D) Ret Mil – Wtd Avg:

Overhead Rate = Change in Overhead Costs / $DLC_{MEO}$ =

= 48,726.32 / 2,909,531.25 = .0167 = 1.67 percent overhead rate

E) Ret Mil – Lo:

Overhead Rate = Change in Overhead Costs / $DLC_{MEO}$ =

= 32,261.82 / 2,909,531.25 = .0111 = 1.11 percent overhead rate

F) Ret Mil – Hi:

Overhead Rate = Change in Overhead Costs / $DLC_{MEO}$ =

= 65,190.82 / 2,909,531.25 = .0224 = 2.24 percent overhead rate

Since the reductions in overhead costs were the same using IAC and NIAC algorithms, these OHRs would also be the same under both algorithms.

## G.2 Calculating the Overhead Rate for the Base Network Control Center (BNCC)

### Setting Up the Model

To estimate the overhead rate for the BNCC, the model must be reset with information about the BNCC. Once again, the user is required to enter the following data: (1) the number of officer, enlisted, and civilian authorizations in the precompetitive CA, by squadron, (2) the precompetitive CA's DLC, and (3) the work year, budget, and DLC transformation rates to be used during the run. All other required data (e.g., each support organization's AFMS equation and current authorizations) are already in the model. As stated earlier, the Base Network Control Center (BNCC) currently has one officer, 32 enlisted, and 3 civilian authorizations incurring total DLCs of $1,716,611.

### Model Operations

**Step 1 – Calculate the MEO's DLC.** This is accomplished by multiplying the CA's precompetitive DLC by the DLC transformation rate. This is the denominator in the formula that computes the CA's overhead rate: $OHR = \Delta OHC / DLC_{MEO}$.

$$DLC_{MEO} = 1{,}716{,}611 \times .75 = 1{,}287{,}458.25$$

**Step 2 – Calculate the precompetitive manning percentage for all support organizations.** This doesn't change from run to run. This is based on the precompetitive manning of each support organization on base and its AFMS. Therefore, it is the same for all simulations. The precompetitive manning percentages for the Vehicle Operations Flight, Services Contracting Flight, Manpower and Quality Office, and Civilian Personnel Office, as computed earlier, are 90, 240, 77, and 100 percent, respectively.

**Step 3 – Compute size of the MEO.** The MEO size is computed by multiplying the precompetitive organization's authorizations by the work year transformation rate. Fractions of authorizations are rounded up to the nearest whole authorization.

BNCC MEO Size = (1 Officer + 32 Enlisted + 3 Civilian) * .75 = 36 * .75 = 27 authorizations

**Step 4 – Convert all military authorizations in the CA to civilian authorizations and adjust the squadron and base populations accordingly.** The total number of officer, enlisted, and civilian authorizations in the Communications Squadron and on base will be modified as follows:

| | Officer | Enlisted | Civilian |
|---|---|---|---|
| FMF | -1 | -32 | +24 |

**Step 5 – Determine the effect on support organization manning given the change in base populations (i.e., implementing the MEO).** For each support organization this is accomplished by using the organization's AFMS and its precompetitive manning percentage.

A) Vehicle Operations Flight:

New relevant base population: 8,428 – 1 – 32 + 24 = 8,419

New number of required man-hours: 1,232.91 + 1.01(8,419) = 9,736.1 man-hours of work required per month

New number of required personnel:

(9 x 147) = 1,323 man-hours performed by civilians

(9,736.1 – 1,323 = 8,413.1 man-hours per month to be performed by military personnel

8,413.1 / 163.2 = 51.55 ≈ 52 required military personnel

So a total of (9 civ + 52 mil) = 61 people are required.

New number of authorizations: 61 x .90 = 54.9 ≈ 55 authorizations

The new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Vehicle Operations Flight by implementing the Base Network Control Center's MEO.

B) The Services Contracting Flight:

New relevant base population: 9,163 –1 – 32 + 24 = 9,154

New number of required personnel: 5 + .0004712(9,154) = 9.31 ≈ 10 personnel

New number of authorizations: 10 x 2.4 = 24 authorizations

The new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Services Contracting Flight by implementing the Base Network Control Center's MEO.

C) The Manpower and Quality Office's AFMS manning matrix and its precompetitive manning percentage are used to determine its new required manning. Using the new relevant base population of 9,031 (i.e., 9,040 – 1 – 32 + 24) and the same notional matrix as was used earlier, the new number of required personnel is 9.

| Relevant Base Population | 1,000-2,999 | 3,000-4,999 | 5,000-8,999 | 9,000-11,999 | 12,000-15,000 |
|---|---|---|---|---|---|
| Manpower Office Manning | 4 | 5 | 7 | 9 | 11 |

New number of authorizations: 9 x .77 = 7 authorizations

The new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Manpower and Quality Office by implementing the Base Network Control Center's MEO.

D) The Civilian Personnel Office:

New relevant base population: 1,595 + 24 civilians = 1,619

New number of required personnel: (1 / 88)(1,619) = 18.40 ≈ 19 personnel

New number of authorizations: 19 x 1.0 = 19 authorizations

In this case, the new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings or additional costs from the Civilian Personnel Office by implementing the Base Network Control Center's MEO.

Since total support organization population has not changed, this step is complete.

**Step 6 – Determine the effect on support organization DLC given the change in manning (i.e., implementing the MEO).** Since there was no change in support organization manning as a result of the decrease in base population, there will be no change in support organization DLC.

**Step 7 – Determine the effect on support organization budget requirements given the changes in manning and base populations (i.e., implementing the MEO).** There was no change in support organization manning, so there will be no change in support organization budget requirements if the MEO is implemented.

**Step 8 – Determine total change in base overhead costs if the MEO is implemented.** The sum of the changes in support organization DLCs and budget requirements is calculated. In this case, there was no change in support organization DLCs or budget requirements, so the total change in base overhead costs by implementing the MEO will be zero.

**Step 9 – Outsource the CA.** The total number of civilian and CME authorizations in the Communications Squadron and on base will be modified as follows:

| | Civilian | CME |
|---|---|---|
| BNCC | -27 | +27 |

**Step 10 – Determine the effect on support organization manning given the change in base populations (i.e., outsourcing the CA).**

A) Vehicle Operations Flight:

New relevant base population: 8,419 - 27 = 8,392

New number of required man-hours: 1,232.91 + 1.01(8,392) = 9,708.83 man-hours of work required per month

New number of required personnel:

(9 x 147) = 1,323 man-hours performed by civilians

(9,708.83) – 1,323 = 8,385.83 man-hours per month to be performed by military personnel

8,385.83 / 163.2 = 51.38 ≈ 52 required military personnel

So a total of (9 + 52) = 61 people are required.

New number of authorizations: 61 x .90 = 54.9 ≈ 55 authorizations

The new number of authorizations is equal to the precompetitive number of authorizations so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Vehicle Operations Flight if the Base Network Control Center is outsourced.

B) Services Contracting Flight:

New relevant base population: 9,154 - 27 = 9,127

New number of required personnel: 5 + .0004712(9,127) = 9.30 ≈ 10 personnel

New number of authorizations: 10 x 2.4 = 24 authorizations

The new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Services Contracting Flight if the Base Network Control Center is outsourced.

C) Manpower and Quality Office:

New relevant base population: 9,031 - 27 = 9,004

| Relevant Base Population | 1,000-2,999 | 3,000-4,999 | 5,000-8,999 | 9,000-11,999 | 12,000-15,000 |
|---|---|---|---|---|---|
| Manpower Office Manning | 4 | 5 | 7 | 9 | 11 |

New number of authorizations: 9 x .77 = 7 authorizations

The new number of authorizations is equal to the number of authorizations if the MEO were implemented, so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Manpower and Quality Office if the Base Network Control Center is outsourced.

D) The Civilian Personnel Flight:

New relevant base population: 1,619 - 27 = 1,592

New number of required personnel: (1 / 88)(1,592) = 18.09 ≈ 19 personnel

New number of authorizations: 19 x 1.0 = 19 authorizations

In this case, the new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings or additional costs from the Civilian Personnel Office if the Base Network Control Center is outsourced.

Since total support organization population has not changed, this step is complete.

**Step 11 – Determine the effect on support organization DLC given the change in manning (i.e., outsourcing the CA).** Since there was no change in support organization manning as a result of the decrease in base population, there will be no change in support organization DLC.

**Step 12 – Determine the effect on support organization budget requirements given the changes in manning and base populations (i.e., outsourcing the CA).** There was no change in support organization manning, so there will be no change in support organization budget requirements if the MEO is implemented.

**Step 13 – Determine total change in base overhead costs if the CA is outsourced.** The sum of the changes in support organization DLC and budget requirements is calculated. In this case, since there was no change in support organization DLC or budget requirements, the total change in base overhead costs by outsourcing the Base Network Control Center's MEO will be zero.

**Step 14 – Calculate the CA's overhead rate.** Since the formula is $OHR = \Delta OHC / DLC_{MEO}$, the overhead rate for the Base Network Control Center will be zero because there were no changes in overhead cost by outsourcing the MEO.

## G.3 Calculating the Overhead Rate for the CA Consisting of the FMF and the BNCC

### Setting Up the Model

To estimate the overhead rate for a CA consisting of the Fuels Management Flight and Base Network Control Center, the model must be reset with information about both the FMF and the BNCC. Once again, the user is required to enter the following data: (1) the number of officer, enlisted, and civilian authorizations in the precompetitive CA, by squadron, (2) the precompetitive CA's DLC, and (3) the work year, budget, and DLC transformation rates to be used during the run. As stated earlier, the Fuels Management Flight (FMF) currently has one officer, 82 enlisted, and 9 civilian authorizations incurring total DLCs of $3,879,375, and the Base Network Control Center (BNCC) currently has one officer, 32 enlisted, and 3 civilian authorizations incurring total DLCs of $1,716,611. Combining the two, this CA will have two officers,114 enlisted, and 12 civilians incurring total DLCs of $5,595,986 (i.e., $3,879,375 + $1,716,611).

### Model Operations

**Step 1 – Calculate the MEO's DLC.** This is accomplished by multiplying the CA's precompetitive DLC by the DLC transformation rate. This is the denominator in the formula that computes the CA's overhead rate: $OHR = \Delta OHC / DLC_{MEO}$.

$$DLC_{MEO} = 5{,}595{,}986 \times .75 = 4{,}196{,}989.50$$

**Step 2 – Calculate the precompetitive manning percentage for all support organizations.** As calculated earlier, the precompetitive manning percentages for the Vehicle Operations Flight, Services Contracting Flight, Manpower and Quality Office, and Civilian Personnel Office are 90, 240, 77, and 100 percent, respectively.

**Step 3 – Compute size of the MEO.** The MEO size is computed by multiplying the precompetitive organization's authorizations by the work year transformation rate. Fractions of authorizations are rounded up to the nearest whole authorization.

| | |
|---|---|
| FMF: | (1 + 82 + 9) * .75 = 69 |
| BNCC: | (1 + 32 + 3) * .75 = 27 |
| MEO Size: | 96 |

**Step 4 – Convert all military authorizations in the CA to civilian authorizations and adjust the squadron and base populations accordingly.** The total number of officer, enlisted, and civilian authorizations in the Supply Squadron, Communications Squadron, and on base will be modified as follows:

| | Officer | Enlisted | Civilian |
|---|---|---|---|
| FMF (Supply Sq) | -1 | -82 | +60 |
| BNCC (Comm Sq) | -1 | -32 | +24 |
| Base Population | -2 | -114 | +84 |

**Step 5 – Determine the effect on support organization manning given the change in base populations (i.e., implementing the MEO).** For each support organization this is accomplished by using the organization's AFMS and its precompetitive manning percentage.

A) Vehicle Operations Flight:

New relevant base population: 8,428 – 2 – 114 + 84 = 8,396

New number of required man-hours: 1,232.91 + 1.01(8,396) = 9,712.87 man-hours of work required per month

New number of required personnel:

(9 x 147) = 1,323 man-hours performed by civilians

(9,712.87 – 1,323 = 8,389.87 man-hours per month to be performed by military personnel

8,389.87 / 163.2 = 51.41 ≈ 52 required military personnel

So a total of (9 civ + 52 mil) = 61 people are required.

New number of authorizations: 61 x .90 = 54.9 ≈ 55 authorizations

The new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Vehicle Operations Flight by implementing the combined MEO.

B) The Services Contracting Flight:

New relevant base population: $9,163 - 2 - 114 + 84 = 9,131$

New number of required personnel: $5 + .0004712(9,131) = 9.30 \approx 10$ personnel

New number of authorizations: $10 \times 2.4 = 24$ authorizations

The new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Services Contracting Flight by implementing the combined MEO.

C) Manpower and Quality Office:

New relevant base population: $9,040 - 2 - 114 + 84 = 9,008$

| Relevant Base Population | 1,000-2,999 | 3,000-4,999 | 5,000-8,999 | 9,000-11,999 | 12,000-15,000 |
|---|---|---|---|---|---|
| Manpower Office Manning | 4 | 5 | 7 | 9 | 11 |

New number of authorizations: $9 \times .77 = 7$ authorizations

The new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Manpower and Quality Office by implementing the combined MEO.

D) The Civilian Personnel Office:

New relevant base population: $1,595 + 84$ civilians $= 1,679$

New number of required personnel: $(1 / 88)(1,679) = 19.08 \approx 20$ personnel

New number of authorizations: $20 \times 1.0 = 20$ authorizations

In this case, if the MEO is implemented the number of authorizations will be one greater than the precompetitive number of authorizations. This additional authorization, and the costs incurred by it (DLC and budget), would be avoided if the CA were outsourced. Consequently, there will be a difference between overhead costs saved including avoided costs (SIAC) and overhead costs saved not including avoided costs (SNIAC). The difference between SIAC and SNIAC will produce different overhead rates, as well.

Since total support organization population has increased by one authorization, base populations are modified to reflect the change and this step is repeated for all support organizations using the modified base population. The modified relevant base populations are 8,397; 9,132; 9,009; and 1,680,[7] respectively. This increase of one authorization does not cause any of the support organizations to gain an authorization, so this step is complete.

**Step 6 – Determine the effect on support organization DLC given the change in manning (i.e., implementing the MEO).** In this case, there was no change in manning in the Vehicle Operations Flight, Services Contracting Flight, or Manpower and Quality Office, but there was one authorization added to the Civilian Personnel Office. As mentioned in the model description (section 3.3.3), when authorizations are added to the Civilian Personnel Office, they are assumed to be GS-11s. So DLCs will increase $64,250 (i.e., the DLCs incurred by a GS-11) if the combined MEO is implemented.

**Step 7 – Determine the effect on support organization budget requirements given the changes in manning and base populations (i.e., implementing the MEO).** Since the Vehicle Operations Flight, Services Contracting Flight, and Manpower and Quality Office did not have a change in authorizations and because these organizations' work loads and budget requirements are not directly dependent on base population, these organizations' budget requirements will not change.

[7] The Civilian Personnel Office's relevant base population of 1,680 assumes a civilian authorization was added. Since the Civilian Personnel Office has no military authorizations, this is a reasonable assumption. As mentioned in the model description, when an authorization is added to the Civilian Personnel Office, it is assumed to be a GS-11.

However, the increase of one authorization in the Civilian Personnel Office will increase budget requirements. The office will require more office supplies, will have to purchase a PC for the new employee, and will need a cubicle and additional facilities (i.e., electricity for the PC, water, sewage). Therefore, the model increases the Civilian Personnel Office's budget requirements by the sum of these costs. In the Civilian Personnel Office's case, the increase in budget requirements for one authorization is estimated to be $994 per year.

The changes in all support organization budget requirements are summed to estimate the total change in support organization budget requirements if the combined MEO is implemented.

**Step 8 – Determine total change in base overhead costs if the MEO is implemented.** The sum of the changes in support organization DLC and budget requirements if the MEO is implemented is -$65,244 (i.e., -$64,250 - $994). The figure is negative to represent negative savings, meaning an increase in costs. This is the case regardless of the authorization-elimination algorithm used to calculate the OHR.

**Step 9 – Outsource the CA.** The total number of civilian and CME authorizations in the Supply Squadron, Communications Squadron, and on base will be modified as follows:

| | Civilian | CME |
|---|---|---|
| FMF (Supply Sq) | -69 | +69 |
| BNCC (Comm Sq) | -27 | +27 |
| Base | -96 | +96 |

**Step 10 – Determine the effect on support organization manning given the change in base populations (i.e., outsourcing the CA).**

A) Vehicle Operations Flight:

New relevant base population: 8,396 - 96 = 8,300

New number of required man-hours: 1,232.91 + 1.01(8,300) = 9,615.91 man-hours of work required per month

New number of required personnel:

(9 x 147) = 1,323 man-hours performed by civilians

(9,615.91) – 1,323 = 8,292.91 man-hours per month to be performed by military personnel

8,292.91 / 163.2 = 50.8 ≈ 51 required military personnel

So a total of (9 + 51) = 60 people are required.

New number of authorizations: 60 x .90 = 54 authorizations

The new number of authorizations is one less than the number of authorizations if the MEO were implemented, so the model eliminates one authorization from the Vehicle Operations Flight.

B) Services Contracting Flight:

New relevant base population: 9,131 - 96 = 9,035

New number of required personnel: 5 + .0004712(9,035) = 9.26 ≈ 10 personnel

New number of authorizations: 10 x 2.4 = 24 authorizations

The new number of authorizations is equal to the precompetitive number of authorizations, so no authorizations are eliminated or added. Consequently, there will be no DLC savings from the Services Contracting Flight if the MEO is outsourced.

C) Manpower and Quality Office:

New relevant base population: 9,008 - 96 = 8,912

| Relevant Base Population | 1,000-2,999 | 3,000-4,999 | 5,000-8,999 | 9,000-11,999 | 12,000-15,000 |
|---|---|---|---|---|---|
| Manpower Office Manning | 4 | 5 | 7 | 9 | 11 |

New number of authorizations: 7 x .77 = 5.39 ≈ 6 authorizations

The new number of authorizations is one less than the number of authorizations if the MEO were implemented, so the model eliminates one authorization from the Manpower and Quality Office.

D) The Civilian Personnel Flight:

New relevant base population: 1,679 - 96 = 1,583

New number of required personnel: (1 / 88)(1,583) = 17.99 ≈ 18 personnel

New number of authorizations: 18 x 1.0 = 18 authorizations

In this case, the new number of authorizations is one less than the precompetitive number of authorizations and two less than the number if the MEO is implemented. The costs incurred by the authorization saved from the precompetitive manning level will be included in savings computations for both SIAC and SNIAC. The costs incurred by the second authorization saved from the MEO-implementation manning level will be included only in savings computations for SIAC.

Since total support organization population has decreased by four authorizations from the MEO level, base populations are modified to reflect the change and this step is repeated for all support organizations using the modified base population. The modified relevant base populations are 8,296; 9,031; 8,908; and 1,581,[8] respectively. This decrease of four authorizations does not cause any of the support organizations to lose another authorization, so this step is complete.

**Step 11 – Determine the effect on support organization DLC given the change in manning (i.e., outsourcing the CA).** In this case, there was no change in manning in the Services Contracting Flight, but there was one authorization eliminated from the Vehicle Operations Flight, another eliminated from the Manpower and Quality Office, and two eliminated from the Civilian Personnel Office. The calculations for each of the six authorization-elimination algorithms are below.

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[8] The Civilian Personnel Office's relevant base population of 1,581 assumes the two authorizations eliminated from the Civilian Personnel Office are civilian authorizations and the other two eliminated positions, from the Vehicle Operations Flight and Manpower and Quality Office, are military authorizations. If all four eliminated authorizations were civilian, the new relevant base population would be 1,579.

Once again, assume the seven authorizations in the Manpower and Quality Office are a Captain (DLC = 83,866), a MSgt (DLC = 62,730), 2 SSgt (DLC = 47,586 each), a SrA (DLC = 40,181), a GS-11 (DLC = 64,250), and a GS-4 (DLC = 31,321). This means the DLCs for the Manpower and Quality Office are $377,520 (i.e. 83,866 + 62,730 + 2 x 47,586 + 40,181 + 64,250 + 31,321).

Due to the size of the Vehicle Operations Flight (46 military, 9 civilian authorizations), it would be impractical to list all authorizations for this example. So assume the lowest three ranking military personnel in the Flight are A1C (DLC = 31,749 each), the three highest ranking are a CMSgt (DLC = 85,705), MSgt, and TSgt (DLC = 55,671), and the weighted average DLC of all enlisted personnel is $38,557. Also assume the three civilian authorizations with the lowest DLC are GS-7 (DLC = 43,409), WG-6 (DLC = 46,857), and WS-2 (DLC = 52,374), the three civilian authorizations with the highest DLC are a GS-9 (DLC = 53,103), WG-10 (DLC = 58,113), WS-4 (DLC = 58,474), and the weighted average DLC of all civilian personnel is $51,156.11.

Now assume the Civilian Personnel Office is manned totally by civilians (i.e., no military authorizations). The three civilian authorizations with the lowest DLC are GS-4 (DLC = 31,321), GS-11 (DLC = 64,250), and GS-11, the three civilian authorizations with the highest DLC are a GS-11, GS-11, and GS-12 (DLC = 77,005), and the weighted average DLC of all civilian personnel is $58,966.40.

Calculations for each of the six algorithms, both including and not including avoided costs, are below.

*Savings, Not Including Avoided Costs (SNIAC)*

A) Ret Civ – Wtd Avg (The Base-Case Algorithm):

Vehicle Ops Flt: Wtd Avg of Enlisted Auth = 38,557

Manpower Office: Wtd Avg of Enlisted Auth = 49,520

Civ Pers Office: Wtd Avg of Civilian Auth = 58,966.40

Reduction in DLC from Vehicle Ops Flt = # of auths elim x Wtd Avg = 1 x 38,557 = 38,557

Reduction in DLC from Manpower Office = # of auths elim x Wtd Avg = 1 x 49,520 = 49,520

Reduction in DLC from Civ Pers Office = # of auths elim x Wtd Avg = 1 x 58,966.40 =

= 58,966.40

Total reduction in DLC by outsourcing combined MEO =

= 38,557 + 49,520 + 58,966.40 = 147,043.40

B) Ret Civ – Lo:

Order of Authorizations, Military First, by Rank/Grade, from Lowest to Highest:

Vehicle Ops Flt: A1C, A1C, A1C, ...

Manpower Office: SrA, SSgt, SSgt, ...

Civ Pers Office: GS-4, GS-11, GS-11, ...

Corresponding DLC for the Ranks/Grades listed above:

Vehicle Ops Flt: 31,749; 31,749; 31,749; ...

Manpower Office: 40,181; 47,586; 47,586; ...

Civ Pers Office: 31,321; 64,250; 64,250

Reduction in DLC = $\Sigma$ of first n DLCs, where n = # of eliminated authorizations

Vehicle Ops Flt: 31,749

Manpower Office: 40,181

Civ Pers Office: 31,321

Total reduction in DLC by outsourcing combined MEO =

= 31,749 + 40,181 + 31,321 = 103,251

C) Ret Civ – Hi:

Order of Authorizations, Military First, by Rank/Grade, from Highest to Lowest:

Vehicle Ops Flt: CMSgt, MSgt, TSgt, ...

Manpower Office: Capt, MSgt, SSgt, ...

Civ Pers Office: GS-12, GS-11, GS-11, ...

Corresponding DLC for the Ranks/Grades listed above:

Vehicle Ops Flt: 85,705; 62,730; 55,671; ...

Manpower Office: 83,866; 62,730; 47,586; ...

Civ Pers Office: 77,005; 64,250; 64,250; ...

Reduction in DLC = Σ of first n DLCs, where n = # of eliminated authorizations

Vehicle Ops Flt: 85,705

Manpower Office: 83,866

Civ Pers Office: 77,005

Total reduction in DLC by outsourcing combined MEO =

= 85,705 + 83,866 + 77,005 = 246,576

D) Ret Mil – Wtd Avg:

Weighted Average of Civilian Authorization = (64,250 + 31,321) / 2 = 47,785.50

Reduction in DLC = # of authorizations eliminated x Wtd Avg = 1 x 47,785.50 = 47,785.50

Vehicle Ops Flt: Wtd Avg of Civilian Auth = 51,156.11

Manpower Office: Wtd Avg of Civilian Auth = 47,785.50

Civ Pers Office: Wtd Avg of Civilian Auth = 58,966.40

Reduction in DLC from Vehicle Ops Flt = # of auths elim x Wtd Avg =

= 1 x 51,156.11 = 51,156.11

Reduction in DLC from Manpower Office = # of auths elim x Wtd Avg =

= 1 x 47,785.50 = 47,785.50

Reduction in DLC from Civ Pers Office = # of auths elim x Wtd Avg = 1 x 58,966.40 =

= 58,966.40

Total reduction in DLC by outsourcing combined MEO =

= 51,156.11 + 47,785.50 + 58,966.40 = 157,908.01

E) Ret Mil – Lo:

Order of Authorizations, Civilian First, by Grade/Rank, from Lowest to Highest:

Vehicle Ops Flt: GS-7, WG-6, WS-2, ...

Manpower Office: GS-4, GS-11, SrA, ...

Civ Pers Office: GS-4, GS-11, GS-11, ...

Corresponding DLC for the Grades/Ranks listed above:

Vehicle Ops Flt: 43,409; 46,857; 52,374; ...

Manpower Office: 31,321; 64,250; 40,181; ...

Civ Pers Office: 31,321; 64,250; 64,250

Reduction in DLC = Σ of first n DLCs, where n = # of eliminated authorizations

Vehicle Ops Flt: 43,409

Manpower Office: 31,321

Civ Pers Office: 31,321

Total reduction in DLC by outsourcing combined MEO =

$$= 43,409 + 31,321 + 31,321 = 106,051$$

F) Ret Mil – Hi:

Order of Authorizations, Civilian First, by Grade/Rank, from Highest to Lowest:

Vehicle Ops Flt: WS-4, WG-10, GS-9, ...

Manpower Office: GS-11, GS-4, Capt, ...

Civ Pers Office: GS-12, GS-11, GS-11, ...

Corresponding DLC for the Grades/Ranks listed above:

Vehicle Ops Flt: 58,474; 58,113; 53,103; ...

Manpower Office: 64,250; 31,321; 83,866; ...

Civ Pers Office: 77,005; 64,250; 64,250; ...

Reduction in DLC = Σ of first n DLCs, where n = # of eliminated authorizations

Vehicle Ops Flt: 58,474

Manpower Office: 64,250

Civ Pers Office: 77,005

Total reduction in DLC by outsourcing combined MEO =

$$= 58,474 + 64,250 + 77,005 = 199,729$$

*Savings, Including Avoided Costs (SIAC)*

When calculating the overhead savings including avoided costs, the model begins with the SNIAC DLC figure, then adds the DLC of the authorization that would have been added had the MEO been implemented. Since it is assumed the added authorization would have been a GS-11 regardless of the authorization-elimination algorithm used, $64,250 (i.e., the DLC incurred by a GS-11) is added to each of the algorithms' overhead cost savings estimates.

A) Ret Civ – Wtd Avg: 147,043.40 + 64,250 = 211,293.4
B) Ret Civ – Lo: 103,251 + 64,250 = 167,501
C) Ret Civ – Hi: 246,576 + 64,250 = 310,826
D) Ret Mil – Wtd Avg: 157,908.01 + 64,250 = 222,158.01
E) Ret Mil – Lo: 106,051 + 64,250 = 170,301
F) Ret Mil – Hi: 199,729 + 64,250 = 263,979

**Step 12 – Determine the effect on support organization budget requirements given the changes in manning and base populations (i.e., outsourcing the CA).** Again, since the Services Contracting Flight did not have a change in authorizations, it will not have a change in its budget requirements either.

However, the reduction of one authorization in the Vehicle Operations Flight, another in the Manpower and Quality Office, and two more in the Civilian Personnel Office will reduce organization budget requirements. The reduction in budget requirements for the Vehicle Operations Flight for one authorization is estimated to be $446.37 per year, the reduction in budget requirements for the Manpower and Quality Office for one authorization is estimated to be $940.82 per year, and the reduction in budget requirements for the Civilian Personnel Office for one authorization is estimated to be $994 per year.

The changes in all support organization budget requirements are summed to estimate the total change in support organization budget requirements if the MEO is outsourced, so the

total reduction in budget requirements will be $2,381.19 (i.e., 446.37 + 940.82 + 994) not including avoided costs, and $3,375.19 (i.e., 2,381.19 + 994) including avoided costs.

**Step 13 – Determine total change in base overhead costs if the CA is outsourced.** The sum of the changes in support organization DLCs and budget requirements is calculated. For sensitivity analysis purposes, the model computes six figures corresponding to the six authorization elimination algorithms. Calculations for the six algorithms are below. Since there were no DLC or budget changes for the Services Contracting Flight, it will be ignored in the calculations.

*Savings, Not Including Avoided Costs (SNIAC)*

A) Ret Civ – Wtd Avg (The Base-Case Algorithm):

Change in Overhead Costs = Reduction in DLC + Reduction in Budget Req'ts =

147,043.40 + 2,381.19 = 149,424.59

B) Ret Civ – Lo:

Change in Overhead Costs = Reduction in DLC + Reduction in Budget Req'ts =

103,251 + 2,381.19 = 105,632.19

C) Ret Civ – Hi:

Change in Overhead Costs = Reduction in DLC + Reduction in Budget Req'ts =

246,576 + 2,381.19 = 248,957.19

D) Ret Mil – Wtd Avg:

Change in Overhead Costs = Reduction in DLC + Reduction in Budget Req'ts =

157,908.01 + 2,381.19 = 160,289.20

E) Ret Mil – Lo:

Change in Overhead Costs = Reduction in DLC + Reduction in Budget Req'ts =

106,051 + 2,381.19 = 108,432.19

F) Ret Mil – Hi:

Change in Overhead Costs = Reduction in DLC + Reduction in Budget Req'ts =

199,729 + 2,381.19 = 202,110.19

*Savings, Including Avoided Costs (SIAC)*

A) Ret Civ – Wtd Avg: 211,293.40 + 3,375.19 = 214,668.59
B) Ret Civ – Lo: 167,501 + 3,375.19 = 170,876.19
C) Ret Civ – Hi: 310,826 + 3,375.19 = 314,201.19
D) Ret Mil – Wtd Avg: 222,158.01 + 3,375.19 = 225,533.20
E) Ret Mil – Lo: 170,301 + 3,375.19 = 173,676.19
F) Ret Mil – Hi: 263,979 + 3,375.19 = 267,354.19

**Step 14 – Calculate the CA's overhead rate.** The formula used to calculate the overhead rate is OHR = $\Delta$OHC / $DLC_{MEO}$. Plugging in the values for the six different authorization elimination algorithms, the overhead rate(s) for the CA consisting of the Fuels Management Flight and the Base Network Control Center is estimated to be:

*OHR, Not Including Avoided Costs (SNIAC)*

A) Ret Civ – Wtd Avg (The Base-Case Algorithm):
Overhead Rate = Change in Overhead Costs / $DLC_{MEO}$ =
= 149,424.59 / 4,196,989.50 = .0356 = 3.56 percent overhead rate

B) Ret Civ – Lo:
Overhead Rate = Change in Overhead Costs / $DLC_{MEO}$ =
= 105,632.19 / 4,196,989.50 = .0252 = 2.52 percent overhead rate

C) Ret Civ – Hi:
Overhead Rate = Change in Overhead Costs / $DLC_{MEO}$ =
= 248,957.19 / 4,196,989.50 = .0593 = 5.93 percent overhead rate

D) Ret Mil – Wtd Avg:
Overhead Rate = Change in Overhead Costs / $DLC_{MEO}$ =
= 160,289.20 / 4,196,989.50 = .0382 = 3.82 percent overhead rate

E) Ret Mil – Lo:
Overhead Rate = Change in Overhead Costs / $DLC_{MEO}$ =
= 108,432.19 / 4,196,989.50 = .0258 = 2.58 percent overhead rate

F) Ret Mil – Hi:

Overhead Rate = Change in Overhead Costs / $DLC_{MEO}$ =

= 202,110.19 / 4,196,989.50 = .0482 = 4.82 percent overhead rate

*OHR, Including Avoided Costs (SIAC)*

A) Ret Civ – Wtd Avg: 214,668.59 / 4,196,989.50 = .0511 = 5.11 percent overhead rate

B) Ret Civ – Lo: 170,876.19 / 4,196,989.50 = .0407 = 4.07 percent overhead rate

C) Ret Civ – Hi: 314,201.19 / 4,196,989.50 = .0749 = 7.49 percent overhead rate

D) Ret Mil – Wtd Avg: 225,533.20 / 4,196,989.50 = .0537 = 5.37 percent overhead rate

E) Ret Mil – Lo: 173,676.19 / 4,196,989.50 = .0414 = 4.14 percent overhead rate

F) Ret Mil – Hi: 267,354.19 / 4,196,989.50 = .0637 = 6.37 percent overhead rate

# Appendix H –

# Instructions to Request Additional Graphical Results

# Contact Information

Graphical results, like those presented in Figures 4-6A through 4-8C, for additional CAs can be obtained from the author by contacting him through the RAND Graduate School at the address below.

RAND Graduate School
1700 Main Street, P.O. Box 2138
Santa Monica, CA 90407-2138

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